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TRANSACTIONS

OF THE

Twenty-eighth Annual Meeting

OF THE

AMERICAN LARYNGOLOGICAL ASSOCIATION

HELD AT

NIAGARA FALLS, N. Y.

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TRANSACTIONS OF THE TWENTY-EIGHTH ANNUAL MEETING OF THE AMERICAN LARYNGOLOGICAL ASSOCIATION.

HELD AT NIAGARA FALLS, N. Y.

MAY 31, JUNE 1 AND 2, 1906.

THE PRESIDENT'S ADDRESS.

BY J. W. GLEITSMANN, M.D.

Fellows of the American Laryngological Association:

IT gives me great pleasure to welcome you here to this beautiful city, so near to the place the memory of which is dear to us all by the organization of our Association the third of June, 1878, at Buffalo. Of the twenty-one gentlemen addressed the tenth of May, 1878, by the late Dr. Frank H. Davis, we are happy to count ten yet as our active members. We can also justly be proud that ours is the oldest national association of laryngologists in existence.

My personal connection with laryngology carries me far back to the years 1867 and 1868, when I spent two summers in Vienna and took courses with Leopold von Schroetter, who will celebrate his seventieth birthday next year. Schroetter's dexterity and his patience and perseverance in training the larynx for introduction of instruments excited the admiration of all his scholars. On one occasion I saw him inject sesquichloride of iron into a tracheal tumor with good results.

Those of us who practised laryngology and rhinology before 1884, the year of the discovery of cocaine, will fully appreciate the difficulties previously encountered and the progress made in our specialty since that time.

To the advancement of our science the members of our Association have contributed their full share, and, in addition to publications scattered in the medical journals, our transactions are an ever-living testimony of their efficient work and labor. The most valuable and potent incentive for this incessant progressive study is in my opinion the fact that the members of our Association with very few exceptions are or have been connected at one time of their life with medical schools in the capacity of teachers and have been found true to our motto, "Docendo discimus."

It is but a natural aim and our first duty to advance science, and by doing so to advance ourselves. There is ample evidence that the members of our Association have conscientiously lived up to this principle, and I have no fear on that score for the future. But besides the scientific efforts and the struggles in daily life, there is in my opinion a feature which we, as members of the oldest and representative American association, should not lose sight of, and this is the endeavor to maintain the standard of laryngology on a par with other specialties, and to have full recognition and representation in medical colleges and congresses.

The rapid development and progress of laryngology during the fifty years of its existence and the faithful, energetic work of laryngologists in all parts of the world have made laryngology and its allied branches a compact science, which cannot be disregarded and must be known in the fundamental principles to the accomplished clinician of the present time. Being progressive in the true scientific sense, improving its methods and enlarging its fields, laryngology is entitled to be accorded the same position as held by other corresponding specialties.

You will be requested to take cognizance of, and to act upon, a letter our Secretary has received a few months ago from the Laryngological Association of Vienna, inviting the laryngologists of the world to celebrate 1908, the fiftieth anniversary of the establishment of clinical laryngology by Tuerck and Czermak. In conjunction with this festival, it is intended to organize an International Laryngological Congress. You are asked not only to send delegates to the celebration, but also to express your views if the formation of such a Congress is desirable and to the interest of our specialty.

The Congress can only be created when the preponderant ma-

jority of the laryngological societies are in favor of its inauguration. As the majority of societies hold only annual meetings, quite a number of replies have not been received yet, but, according to recent letters of Professor Chiari to your President, thirteen societies have expressed their formal consent, one of which, and the only one in the United States so far, is the American Academy of Ophthalmology and Oto-Laryngology. In addition a large number of other societies have declared their approval and many prominent laryngologists of different countries have promised their appearance.

The reason for such a movement is not far to seek and is obvious to one who has followed the history of the international medical congresses. At the fifteen congresses held, laryngology was allowed the privilege of a separate, full section only four times, viz., at Copenhagen, Berlin, Rome and Paris. At other meetings, as a rule, otology and laryngology formed one section, divided into two subsections; but it was left to the Lisbon committee to add a third subsection on a par with the other two, viz., stomatology. The controversy about this arbitrary proceeding was carried on with a good deal of feeling in several quarters, and the action of the Lisbon committee, as well as the futile, urgent demands made repeatedly to the different committees of organization to accord to laryngology the position it is entitled to, were the real factors for the proposed inauguration of an international laryngological congress.

The cause of these unpleasant features lies in the deficient organization of the international congresses themselves. The local committee of the meeting-place has arbitrary power, can amalgamate sections or form new ones as it chooses, which at the last congresses ranged from sixteen to twenty-three in number. It selects the speakers on the subjects for general discussion, the honorary presidents, and against its decisions no direct redress can be had by aggrieved parties.

To prevent such occurrences if possible in the future, two communications were sent simultaneously but independently of each other to Dr. Semon in London last fall, one by Professor Posner of Berlin, the other by your President. The former one, published in the *Berlin Clinical Weekly,* September 4th, reached the editor of the *Internationales Centralblatt* in time for reproduction

and editorial remarks in its October issue, while the latter was delayed in transmission and with my consent suppressed, as I preferred not to have my propositions published as a belated communication. Professor Posner's and my own views coincided in the principal points, viz., to curtail the power of the local committee of organization and to transfer the same to the national committee and the delegates to the congresses.

The position of laryngology in medical colleges and universities is more gratifying in the United States than abroad; however, much remains to be desired yet. As it was impossible to obtain catalogues from all colleges, the majority of data was taken from *Minerva* of 1905, which furnished also the information about foreign colleges. In twenty-nine colleges of the United States having the largest number of students, laryngology was taught by fourteen professors in ordinary; in two by so-called special professors; in another two by professors residing elsewhere; clinical professors taught in eight; lecturers in two; in the remaining six there was no teacher of laryngology.

If we compare with these data briefly the conditions on the Continent, we find that B. Fraenkel's assertion in the *Internationales Centralblatt,* July, 1905, is still true, viz.: "We have not yet a regular professorship for laryngology." The majority of teachers in the twenty German, the nine Austrian, and the five Swiss colleges are so-called extraordinary professors, with the exception of Rostock and Brussels, where laryngology combined with otology is taught by a full professor.

But if we consider that in six of our colleges mentioned above laryngology has no representative at all, and that in one of our best ones it is taught by instructors, we have sufficient reason not to remain idle, but to endeavor to elevate our specialty to the standard it deserves.

Permit me now to draw your attention to a few subjects which are nearer to our heart.

We have to be grateful that our rank has not been broken by the All-destroyer during the past year. Although we have lost no active nor corresponding Fellow, one of our former active members has died, and I think it is due to his long-standing membership and his frequent attendance at our meetings that his death should not pass unnoticed by us.

Carl Seiler was 56 years of age, when he died in Scranton, Pa., October 10, 1905. He was one of the founders of this Association and remained on the list of active members till 1903. Dr. Solis-Cohen kindly informed me that Seiler's mother was a former assistant of Helmholtz in his famous experiments on acoustics and an accomplished singing teacher. Dr. Seiler, after graduating in Switzerland, joined his mother in Philadelphia, studied under Dr. Cohen, and became his assistant. Going abroad for further study, he took up also pathology, and after his return became soon recognized as one of the best pathologists in Philadelphia. He founded the Union Dispensary and was president of the Pathological and of the German Medical Society. His handbook on Diseases of the Nose and Throat was published 1879, and the three subsequent editions testify to its popularity and the faithful work of its author.

Although never connected with our Association, by the death of Professor Schech of Munich, last year, laryngology has lost one of its best men, whose model text-books will secure him a permanent place in its history.

The harmonious meetings of the Council and the efficient work of our Secretary are entitled to the fullest credit in the management of our affairs, and I can only add my words of praise to those of my predecessor, Dr. Rice, especially as to our Secretary, whose labor can only be appreciated when working with him in the preparation for our annual meeting. The affiliations of a number of our members with other societies, and the twenty-year clause, to which Dr. Bryan has already drawn your attention, make his task more difficult than before. Although always some of the best papers are presented by the older members, with the yearly increasing number of members exempt from the obligation of reading papers or coming to our meetings, we are not assured of their continuous co-operation, and before long you will, in my opinion, be obliged to give this matter your earnest consideration.

In conclusion, permit me to indicate a few lines which in my opinion will yield a worthy and fruitful field for future work and investigation.

The technique of examining the upper air passages has reached,

a high degree of perfection and has found its fitting climax in bronchoscopy, whose possibilities seem not to be exhausted yet.

Physiology and pathology claim our foremost attention and their problems have to be solved by clinical observation as well as by experimental and biological researches. Although many and excellent contributions to the neurology of the larynx have appeared in recent times, the ultimate cause of the proclivity of the abductors to paralysis has not yet been definitely ascertained. Our former member, Donaldson, Jr., and the late Hooper have discovered the differential influence of certain irritations on the recurrent, and it seems at present that not so much anatomical conditions as investigations of the chemical and biological differences will solve the question.

To the study of the etiology of diseases of the mucous membranes, the manner of entrance of bacilli, Dr. Rice has drawn your attention last year. Our member Jonathan Wright has been making extensive investigations of this subject for some time.

The improved technique has also facilitated diagnosis in many directions, and especially the Roentgen rays are often indispensable and are very useful in accessory sinus disease. Their more frequent use cannot be too highly recommended to the rhinologist and laryngologist. We are glad to have a paper and demonstration on this subject by Dr. Coakley on our program.

We have made great progress in our therapeutics, in the medical as well as surgical line, in recent years. But our desire to effect a cure is not yet gratified; for instance, in the severe forms of parenchymatous infections of the pharynx, in cancer, in tuberculosis. In surgery our accomplishments have found full recognition in all quarters, and there exists a praiseworthy zeal to improve on the old or to devise new methods. One suggestion I would venture to make, viz., that laryngotomy be more frequently resorted to in suitable cases and be carried out by the laryngologist instead of the surgeon. In the practice of the large number of members of our Association cases of laryngeal neoplasms, of subglottic tumors, will occur which cannot be removed endolaryngeally, and it is certainly a source of greater satisfaction to relieve a patient by our own action than to turn him over to the surgeon.

I hope that the subject for general discussion, "Diseases of

the Trachea," will act as a stimulus to cultivate this field more energetically than heretofore, as it opens new and brilliant prospects for successful work.

The honor you have conferred upon me by electing me your presiding officer is, in my opinion, the highest a laryngologist can attain. Allow me to express to you my keen sense of appreciation and the hope that I shall be found worthy of your confidence.

REMARKS ON SUBMUCOUS RESECTION OF THE NASAL SEPTUM AND ALSO ON THE MERITS OF OBLIQUE INCISIONS IN CORRECTING SEPTAL DEVIATIONS.

BY THOMAS R. FRENCH, M.D.

THE new submucous operation, or window resection of the nasal septum, which Killian of Freiburg, Freer of Chicago, and others have made so attractive and apparently easy by their small arsenal of ingenious devices, is no doubt the main reason for so much attention having been drawn to the septum in rhinological circles during the past year or two.

Given a suitable local condition in a subject possessing a good morale, the submucous resection of a portion of the cartilage or bone of the septum for the removal of a deviation or spur can now be accomplished in an ideal manner and this operation unquestionably marks a distinct advance in nasal surgery and is a valuable addition to our methods for giving relief. The seeming objections to it in cases of septal deviation are, however, not a few. The bulk of the septum can be readily removed by this method and the obstruction to respiration caused by the redundancy of tissue can thus be easily overcome. But in order to remove the obstruction, a part, and in some cases a very large part, of the substance of the septum must be obliterated. The tensile strength of the septum is very considerable, and it is capable of withstanding a great amount of force applied to it. The questions at once present themselves in connection with this operation: Does or does not the loss of a large portion of the substance of the septum increase its liability to subsequent fracture? and does it also make possible an ultimate change in the external nasal outline? These questions have not yet been satisfactorily answered, for the operation has not proven itself by a sufficiently long experience or been seasoned enough to know just how well it is to wear.

In many of the writings on the new operation we are told that it is believed that the normal substance of the septum is reformed, at least to some extent, if the perichondrium or the periosteum is not torn or cut away in the process of stripping off the mucosa. It is just here that the whole difficulty lies. If it could be demonstrated that as strong a partition as the normal nasal septum is reproduced in every case, and especially in children before the general growth of the tissues about the nose could give rise to deformity, then the operation would have to be regarded as ideal and would be the preferred operation of the future. Any objections to the final results of this operation must of necessity be theoretical, for the material upon which to base practical objections is not at hand, and until results of many years standing can be exhibited we must hold our final opinion in abeyance. I am particularly sceptical, however, in regard to the freedom from the possibility of deformity when sweeping operations of this character are performed upon patients who are below the age in which the greatest growth occurs, and until conclusive demonstrations are forthcoming, from the cases of children who have already been operated upon, I do not think that we have the right to operate in this way on any subject under the adult age. In my opinion it cannot therefore be wise to remove the support of so large an amount of tissue as a deviation usually represents in any but adult heads. In childhood and in youth, we cannot know what, under such circumstances, might happen to such an important prop in the stage of the greatest constructive activity. Several cases in which the septa of children were resected have been favorably reported a year or more after operation, but such a report is, it seems to me, far from sufficient evidence upon which to base an opinion in a matter of so much importance.

Again, it must be understood that the new method offers no promise of correcting external deformity caused by a deviation of the septum. In cases where the anterior free edge of the cartilage is deflected into the anterior nasal opening, it is advised that the obstructing free edge should be cut out, together with the amount involved in the deflection, leaving only a slender cartilaginous bracket to support the dorsum of the nose until the septum becomes firm or new tissue is formed. If the anterior free edge of the cartilage should in such a case be removed up to

the tip of the nose, then the external deformity would not be corrected and the air supply might or might not be increased; for the two layers of mucous membrane stretching from the deflected anterior angle of the cartilage at the tip of the nose to the spine of the intermaxillary bone, even if freed from the enclosed cartilage, would remain to partly obstruct the nasal opening.

The mere fact that the partition is firm to the touch after these operations is, apparently, no proof that cartilage or bone has been reformed, for a part of such a firm partition from one case was examined under the microscope by Hurd more than a year after operation and no cartilage or bone was found. I am not aware that any other examination of this character has been made. It would appear, therefore, that no one has yet demonstrated the reformation of cartilage or bone in these cases. The partition becomes firm to the touch soon after the operation and it is assumed, on this account, that cartilage or bone really exists, whereas in all probability only bands of fibrous tissue are thrown out from each side of the perichondrium. Killian, who, it is believed, has operated upon as many of these cases, by the method under discussion, as any operator, disposes of this feature in these words: "In cases which I have examined after some time had elapsed, I find that the septum has acquired quite an amount of resistance. It thus appears to be correct, what other writers have already maintained, that reformation of bone and cartilage takes place from the perichondrium and periosteum."

Even if cartilage and bone do not reform, if the deviation does not include the anterior free edge of the cartilage and is of a character which requires the sacrifice of but a relatively small part of the septum, I believe that the submucous-resection method of operating is not only justifiable but is possibly to be preferred. But when the deviation is extensive and the resection must of necessity be sweeping, we have a right, in the absence of definite and detailed reports of the ultimate results in such cases, to withold our approval of what properly seems to be a jeopardizing procedure. The one feature however upon which I wish to lay stress in my comments at this time is that because of the lack of knowledge of the ultimate effects of the operation upon the external nasal outline before full growth has been attained, we

have no moral right to subject children to the risk of facial deformity simply because the operation is new and attractive and does not oblige the patient to submit to the somewhat disagreeable after-treatment required by some of the older methods.

There are two frequently noted objections to the operation of submucous resection, viz., the length of time necessary to accomplish it and the occasional occurrence of perforations after it. The time needed depends upon the experience and skill of the operator, but the amount of time ought not to be urged as an objection if the results warrant it. I believe that it has been sufficiently demonstrated that perforations are not at all likely to follow operations which are performed in a proper manner.

I do not wish to pose as an opponent of submucous resection of the septum. Indeed I am not that, but, on the contrary, am a warm admirer of the method for the relief of nasal obstruction in a certain selected class of cases. I have prepared these notes partly to sound a warning against too great a sacrifice of the septal support in adults, but more particularly against operations of this character on the septa of children.

One of the chief reasons given for the advocacy of the operation of submucous resection is that failure so frequently follows attempts to correct deviations of the septum by all other methods. There can be no doubt about the validity of one of the other objections to the method of replacement, viz., the somewhat prolonged and disagreeable after-treatment, but in the light of my own personal experience in cases where I have followed the after-treatment to the end, I do not believe that failure need often result from the employment of what heretofore have been regarded as the standard methods. That many failures have followed attempts to correct deviated septa by the various methods of incision and forcible replacement cannot be denied, but I am not disposed to attach all the blame to the methods themselves. The failures are unquestionably not infrequently due to a lack of knowledge of the mechanical laws involved and intelligent care in after-treatment. Success in the replacement of a deviated septum depends, as in any and every other difficult operative procedure, upon attention to detail. A horizontal and vertical cut through the convexity of the deflection, forcing the fragments into the unobstructed naris, and the introduction of a splint or

tube to retain them in position, are not all that is required. A study of the deflected partition will show where the incisions should be made to get the best results, and after they are made the resiliency of the cartilage must be destroyed to prevent a tendency of the parts to return to their former position.

A year or more ago I became aware of a reason why some of the cases operated upon for deviation of the septum did not result successfully, and since applying the remedy to overcome the difficulty I have had such uniformly good results that I am disposed to believe that it will prove to be a feature of value in these operations. When the ordinary incisions are made through the septum they leave an edge which is at right angles to the surface of the cartilage—in other words, a square edge. If, after section of the septum with such straight cuts, overlapping does not occur, or is slight, there are apt to be several points at which the edges of the flaps may catch each other and so prevent the desired overriding. I now make both horizontal and vertical incisions obliquely, so that all the cut edges of the cartilage or bone are left with rather sharp angles. That not only furnishes a greater amount of tissue for the overlap, but, because of the slanting shape of the edge of the flap, each edge is almost certainly prevented from catching and holding the opposite edge; or, if the edges are engaged at an angle (that is, by crossing each other), they will, because of their thinness, split each other under the retaining pressure of the splint, and there will be a much greater likelihood of the flaps being held up to the median line than if their edges were square.

NOTE.—Since writing the above lines I have found in Beaman Douglass's recently published and admirable treatise on "Nasal Sinus Surgery" the following words which bear upon the feature referred to in this paper: "With the little finger placed in the side which was obstructed, the cut and fractured triangular cartilage is pushed into the opposite side a little past the median line. In doing this a very slight overlap frequently takes place along the edges of the incision, especially if the incision through the cartilage is slightly bias."

REPORTS OF CASES.

BY THOMAS HUBBARD, M.D.

I. *Sarcoma developing in fibromyxoma of epitonsillar space. Operation. No recurrence.*

F. H., male, age 40, presented a clean bill of health, present and past generations. For two months patient has complained of a lump in his throat, painless and only slightly interfering with deglutition. The mass is manifestly growing rapidly and now affects speech. The patient states that he has probably had the original tumor since boyhood, as he can on retrospection determine its existence as a mass of the size of a walnut above the left tonsil.

Examination reveals a nodular ovoid mass about two and one-half inches in longest diameter, situated just above the left tonsil and in the substance of the velum palati muscle. The tonsil is not a part of the growth and is displaced downward. Nodules of active growth give the mass an irregular shape, and such nodules appear highly vascular.

Having determined that the growth was not cystic by the use of the aspirator, total extirpation was done under Sleich infiltration anesthesia. The mass was enucleated without rupture of capsule and with very little laceration of the muscle. The wound was closed by stitches and healed promptly without noticeable distortion and no functional disturbance. The patient went to work in a week and there has been no recurrence now ten months after operation.

The bisected tumor is herewith presented for inspection.

PATHOLOGIST'S REPORT.

F. H. Microscopical examination of sections shows the neoplasm to consist of a stroma of fibrous tissue with a marked proliferation of abnormal connective-tissue elements, myxomatous degeneration, and small round-celled infiltration. Spindle-shaped, small round and large round connective-tissue cells are found which exhibit great variations in their staining qualities. Certain fields appear to be portions of a fibromyxoma, while others present the picture of a rapidly progressing round-celled sarcoma.

Diagnosis. *Mixed-celled sarcoma* (of the soft palate).

N. WORTH BROWN.

II. *Sarcoma of the neck following extirpation of the tonsil.* W. S. O., male, age 30, presenting an excellent health record, personal and family, with the exception of chronic tonsillitis with occasional abscess formation, had an unusually severe peritonsillitis in May, 1905. The left tonsil was decidedly swollen and painful and a small amount of pus formed. The cervical glands were enlarged and tender. As in many previous attacks, the throat remained sore for some time; in fact, he stated that he was rarely free from throat irritation, nor did the glandular swelling subside.

The chain of lymphatics in direct communication with the tonsil was all in a state of hyperplasia, making a large irregular mass along the anterior border of the sternomastoid, and he informed me that he had not been free from enlarged glands for some years. The clinical picture was that of specific adenitis, and he was treated with heroic doses of iodides and mercurials but without any benefit. The surgical procedure was undertaken with proper precautions, as my suspicions were aroused by the sprouting granulomatous appearance of the tonsil and associated glandular hyperplasia, and the patient was so informed.

In August the tonsil was removed, cutting forceps and scissors being employed, and the wound healed without inflammatory reaction. In a short time the throat symptoms had all subsided, and thereafter he had no discomfort where formerly had been constant irritation. The excised pieces were submitted to Dr. W. J. Stone, and having studied seven sections he pronounced it a condition of simple hyperplasia.

The cervical glands did not improve, but remained enlarged and tender.

Two months later the glands were tender and fluctuating, and there were slight daily elevation of temperature and general malaise. The throat was in excellent condition. The infiltration of cervical tissue had extended and there was marked fixation of the neck, the head being drawn to one side. He readily consented to operation, having been informed of the possible malignancy of the glandular disease. The operation was skillfully performed by Dr. James Donnelly, the mass being enucleated without rupture of the capsule. Deep in the wound there was noted a smaller growth of more vascular character and not encapsulated. This lay directly upon the sheath of the large vessels of the neck, and in the dissection the jugular and carotid were exposed, the vagus and recurrent laryngeal apparently in contact with the growth. The wound healed promptly and he left the hospital in ten days. The mass removed was apparently a broken-down gland, the capsule being filled with pus and caseous tissue. At this stage it looked like a simple glandular infection from a diseased tonsil, possibly of tuberculous nature.

The patient was not seen for two months, and when he presented for examination my first impression was that he was in a tuberculous state. He was emaciated, coughed constantly, and the neck was infiltrated and tender. His health had been perfect for a month or more, and then suddenly he developed a spasmodic cough and later uncontrollable vomiting. He experienced a burning sensation in the lower part of the wound coincident with the symptoms of vagus irritation. There was a normal appetite, but food was usually vomited soon after ingestion. The left vocal cord was paralyzed and there was some difficulty in deglutition.

It was evidently a recurrence involving the trunk and laryngeal branch of the vagus. There was also a most distressing neuralgia of the temporo-occipital branch of the fifth, suggesting an upward extension of the growth.

The patient requested an operation, as his distress was great, and it was undertaken with the purpose of liberating the nerve trunks involved, and with little hope of complete removal of the growth, as it involved tissue from the base of the skull to the clavicular region.

My principal object in reporting this case is to record the rather remarkable result of this feature of the operation. The tract from sternomastoid process to clavicle was exposed and all neoplastic tissue dissected out. The nerves involved were carefully liberated. Although the operation was a prolonged one, he experienced relief as soon as the nausea of anesthesia had passed. The voice became very good, there was no more spontaneous vomiting, and no pain in the branches of the fifth. He gained in weight and was in comfortable condition for several weeks. Pain in the fifth returned later, and he apparently derived much benefit from X-ray treatment. Paralysis of the hypoglossal indicated advancement of the growth to the base of the skull. He lived for two months, and there was slight recurrence of the distressing symptoms incident to involvement of the vagus and its branches. It is probable that the nerve again became a part of the tumor mass, as was evidenced by disturbance of cardiac function, fainting and dyspnea without apparent cause, but the voice remained fairly clear, there was no coughing suggestive of recurrent laryngeal irritation, and very little nausea. The result fully justified the operation.

PATHOLOGIST'S REPORT.

W. S. O. The section of tonsil showed hypertrophy and hyperplasia due to the increase of lymphadenoid elements but with no evidence of saroma or carcinoma. The first specimen removed by Dr. Donnelly from the neck was a large, lemon-sized encapsulated mass resembling an enlarged gland. Upon section its

structure was soft and necrotic. Microscopical examination showed it to be a caseating small round-cell lymphosarcoma. The second specimen received from Dr. Donnelly revealed the same microscopical picture. The cells constituting the new growth were in direct contact with newly formed blood spaces, were of the small round-cell type, containing relatively little cytoplasm and rather large spherical or slightly oval nuclei, many of which were in an active state of division. Delicate connective-tissue trabeculæ were formed only near the margin of the growth.

Diagnosis. *Small round-cell lymphosarcoma of compound lymph gland.*

WILLARD J. STONE.

FIBROMA OF THE LARYNX IN A CHILD OF FIVE YEARS. APPARENT CURE. RECURRENCE AS A PAPILLOMA. LARYNGO-FISSURE. CURE.*

BY THOMAS J. HARRIS, M.D.

I HAD the pleasure of reporting this case before the Association a year ago. The child came under my care at the Manhattan Eye, Ear and Throat Hospital the previous summer, where an emergency tracheotomy was performed. Examination of the larynx under ether for the cause of the stenosis showed a distinct neoplasm. A section was removed for microscopic examination and the pathologist reported that the tumor was a fibroma. A laryngo-fissure was made in September, 1904, and the tumor removed. An intubation tube was worn for some time to prevent cicatrical stenosis. In February or March, 1905, I presented her to the Section on Laryngology, New York Academy of Medicine, regarding her then as at least temporarily well. There was no evidence of neoplasm in the throat, and she was sent to the country.

Some time later, because of certain new symptoms, the child was admitted to the service of Dr. John Rogers, at Gouverneur Hospital, and while there gave evidences of increasing obstruction. In September, Dr. Rogers asked me to see the case again, and under ether I found the larynx to be filled with what seemed to be granulomata. Enough of this was removed for microscopic examination, and this time it showed a very clear-cut picture of papilloma. The following week Dr. Rogers repeated the laryngo-fissure, removing the growth. The child then wore another tube from September to February, since when she has been without any aid to breathing, and now seems entirely well.

Among the interesting points in this case were: First, the transformation in the character of the growth from a fibroma to

*See TRANSACTIONS, 1905, p. 212.

a papilloma, a circumstance which is unique in my experience, but may be explained by the irritation of the tube which she wore so long; second, the curative results of the external opening of the larynx. The voice, however, is gone. A fair view of the larynx can be obtained with the short Killian tube, and, while there is no evidence of any neoplasm, there is very little cord remaining. I would be very glad to receive any suggestions whereby the reproduction of the voice might possibly be assisted.

Discussion.

DR. J. SOLIS-COHEN.—The reader of the paper having referred to me, I might say that I do not think there is the slightest connection between the fibroma and the papilloma. My own practice has been in these cases of tumors in the larynx to prefer the tracheotomy tube to the intubation tube, so as to avoid the irritation produced by the intubation tube, and thus avoid any subsequent danger to the patient. It is simply a difference of opinion. As to young children, of course it is better to do the laryngofissure in a child that is not docile. We prefer to do our work through the mouth when possible, but do not want to push it too far. With regard to fibroma, a few weeks ago I had occasion to perform an operation for the excision of a malignant growth of the larynx, and looked up some of my records, and I found that long before the days of asepsis, or of cocaine, or of adrenalin, nearly forty years ago I had reported in the *Medical Record* of New York (1867, p. 218) a case of a fibroma I removed by thyrotomy without previous tracheotomy. On the third day the patient was up; on the fifth day he walked the square around the hospital, and on the seventh he was at work at his shoemaker's last. I do not think that since the days of asepsis and electric light and cocaine we have had any better success; but, of course, the success of that day was due to cleanliness, as are the successes of to-day.

DR. G. HUDSON MAKUEN.—I would like to ask Dr. Harris if the child can whisper? I think the whispering voice should be encouraged, and then after that the resonant tones might be developed in case there was a sufficient amount of vocal cord tissue left to make it possible.

DR. HARRIS.—I have only to answer that the child can whisper audibly and be heard perhaps 2 or 3 feet away. There were in this imperfect half that I got of the larynx some remains of the vocal cords, but they were in a mutilated or atrophied condition. For the better part of two years she has been feeling easier as the result of the intubation tube.

MALIGNANT DISEASE OF THE TONGUE, WITH A REPORT OF TWO CASES.

BY JOSEPH H. BRYAN, M.D.

IT is apparent to every one that malignant affections of the tongue and upper air passages are on the increase, and I believe that it is only by the careful study of these affections, from the clinical side as well as from the pathological standpoint, can we ever hope to gain any definite knowledge regarding this at present much unknown subject. In the majority of instances it is the throat surgeon to whom these unfortunate patients first appeal for relief, and upon him devolves the responsibility of making an early diagnosis and of insisting upon an early operation in order to bring these cases to a successful issue. It is therefore very desirable that whenever the opportunity offers there should be a free interchange of our experiences, and with that end in view I have to report two interesting cases that have recently come under my observation.

CASE I. Last summer while in Paris, I was consulted by a friend of mine, a man about sixty years of age, for what he considered an obstinate ulcer of the tongue. I knew him to be a man of abstemious habits, as regards both smoking and drinking.

On examination I found an indurated ulcer about the size of a ten-cent piece on the right border of the tongue about its posterior third. It had an irritated appearance, caused by the use of strong applications of nitrate of silver and iodine gargle, which he had been using on the advice of the several physicians he had previously consulted. There was a general sense of discomfort and occasionally pain at the seat of the ulcer. No enlargement of the glands on either side of the neck was observed, all local applications were positively prohibited, and he was referred to Mr. Butlin,whom he saw within ten days, who confirmed my diagnosis of a malignant growth of the tongue and urged an immediate operation. This was about the latter part of August. I reached London in time to be present at the operation, which was done September 1st. A preliminary laryngotomy having been done, the whole right half of the tongue and a portion of the floor of the mouth were excised by means of the scissors; a gauze

wick was placed in the back of the tongue near the floor, while the edges of the anterior half were brought together with catgut sutures. The patient made a rapid convalescence, being able to be about his room within ten days.

About three weeks from the date of the original operation Mr. Butlin made a complete dissection of the right side of the neck, removing all the glands that could be found. From this operation the convalescence was also quick and favorable, and he was able to return to this country about the latter part of October.

The pathological report from the Imperial Cancer Research Committee states that nothing looking like cancer was apparent in the glands either to the naked eye or to the microscope, but that in regard to the tumor removed from the tongue was extremely unsatisfactory; it states the growth is a well-developed squamous cell carcinoma which infiltrates very widely, isolated groups of epithelial cells being found in the deepest parts of the thin slice from the center of the growth.

From the time of his arrival in this country until January 1st he was under the careful observation of Dr. Collins Warren, of Boston, after which date he returned to Washington and came under my care. I made three examinations, a month apart, and found him in a most satisfactory condition. There was not the slightest evidence of any return of cancer in the mouth, and, while not expecting any trouble on the left side of the neck, I carefully searched for enlarged glands on that side as well as on the affected side. March 13th, two weeks after the last examination, he reported at my office, stating he had discovered a small swelling in the left side of the neck. The examination revealed a small glandular enlargement about the size of an almond, located about the bifurcation of the common carotid. There was no tenderness and no other enlarged glands could be detected. He then stated he had an imperative business appointment in Florida, which he desired to keep. I at first advised against his going, but finally yielded, with the understanding that he should return immediately if he found there was an increase in the swelling. Instead of being absent two weeks, as he expected, he returned within five days. The glands in the neck had enlarged very rapidly; a large painful mass could be easily felt over the carotid artery; the tongue was heavily coated, and he had intense pains extending over the left side of the face and head and down into the left arm.

Dr. Finney was called in to see him, and it was decided to operate, which he did March 28th. As soon as the neck was opened his condition was found to be much more grave than we anticipated. A large cancerous mass was found in the deeper parts of the neck well under the sternocleido-mastoid muscle, and so firmly attached to the internal jugular and the common carotid that the coats of these vessels contained cancerous tissue which it was

impossible to remove. It therefore became necessary to ligate and excise an inch or more of both vessels. The submental and maxillary glands were slightly enlarged and they also were removed. The wound was then closed, except for the lower third of its extent, in which was placed a gauze wick for drainage. On opening the excised portion of the carotid artery, the vessel was found to be in the most advanced stage of atheromatous degeneration, and attached to one of the atheromatous plates was a large and firm thrombus. The duration of the operation was about two hours and the anesthetic used was ether.

The patient rallied well from the anesthetic and passed a fairly comfortable night, but about eight o'clock the following morning he developed a complete right hemiplegia. At three o'clock the same afternoon pneumonia in the left lung set in, and he died at four o'clock on the following afternoon, just forty-eight hours after the operation.

CASE II. This case was in a man seventy years of age, unusually vigorous for a man of his age. I had been seeing him frequently for the past year or more for an obstinate dysphagia, without being able to find a cause for it. I saw him for the last time about the latter part of April, 1905, prior to his leaving town for the summer. Nothing abnormal about his larynx or fauces could be detected then. October 1st he came to me for the customary examination, and I found at the base of the tongue a large mass projecting out of the larynx up to the level of the tongue and having the appearance of an exaggerated degree of edema of the epiglottis. There was no pain in the region of the larynx nor any difficulty in swallowing. In fact the patient was not conscious of anything wrong with his throat. The growth bled easily on manipulation. Examination of the neck showed a small glandular enlargement about the bifurcation of the common carotid artery on the left side. A small portion of the growth was excised and sent to Dr. Carroll, the pathologist of the Army Medical Museum, for examination. Following is his report:

"An examination shows that the condition is one of surface epithelioma without the formulation of pearls. The dipping downward of the growth from the surface epithelium can be clearly traced. The location appears to be at the junction of the tongue and epiglottis, and the transition from stratified squamous epithelium to minute papillæ is distinctly shown. No muscle fibres are found, and the underlying tissue consists of lymph nodes and alveolar tissue rich in lymphoid cells and lymph vessels."

An operation was decided imperative, and Dr. Finney was asked to take charge of the surgical side of the case. October 17th, the patient being under ether anesthesia, Dr. Finney did the Kocker operation. As soon as the tongue was drawn through the

opening in the mylohyoid muscle, the floor of the mouth and the upper part of the larynx were brought well into view. It was then discovered that the growth sprang from the base of the tongue, and the epiglottis was not at all involved, as we were led to believe by the laryngoscopic appearances. The epiglottis was, however, curled upon itself from the pressure of the growth. The left half of the tongue was then removed and a portion of the base of the right half. The submaxillary and sublingual and several enlarged cervical glands were also removed through an incision carried some distance down onto the neck. The wound was then partially closed and a gauze wick passed from the mouth through the opening in the most depending portion of the wound in the neck.

The patient made a slow but uninterrupted recovery, the wound taking about six weeks before it completely closed. He was very much annoyed during this period by fluids and food passing from the mouth through the wound, necessitating frequent changes of the dressings. The sinus finally closed, but there was left a thick and indurated condition of the neck over the site of the sinus.

The articulation in this case was very much disturbed in the beginning, but of late has been gradually improving. Another annoying symptom, and one that continues to trouble him very much, is the constant accumulation of mucus in the mouth.

In the early part of April the swelling in the neck became very red and painful and finally broke down, discharging some pus. At first it seemed as though this was a secondary infection of the skin, but under the use of the X-rays the parts thoroughly healed again, all the thickening and induration have been absorbed, and at present, nearly eight months since the operation, there is no indication of any recurrence.

These two cases are both interesting and most instructive, and show the decided importance of an early recognition of this dreaded disease. Jacobson and Steward, in their work on "The Operations of Surgery," state that it will be a happy day when the belief is accepted and acted on that cancer of the tongue, like many other epitheliomata, has a precancerous stage, and this is the stage when we should operate. The terrible malignancy of cancer of the tongue is shown by its rapid development, which is aided by the warmth and moisture of the mouth and by the constant irritation it is subjected to, and also by the almost certain and early invasion of the glands of the neck.

Case I. is an unfortunate example in the delay of recognizing the disease, and it shows several unusual features, especially the absence of infection of the glands of the neck on the affected

side and the sudden outburst in the glands on the opposite side of the neck. Mr. Butlin, in speaking of the case, says it evidently was hopeless from the beginning, but we should not take a desponding view of the treatment of epithelioma of the tongue; that it was an exceptional case and an earlier operation might have had a more successful result. He also states that affection of the glands on the opposite side of the neck when the disease is actually on the border of the tongue, as it was in this case, is a very unusual occurrence, although he has met with it two or three times. He is not prepared at present to advocate the removal of the glands on both sides of the neck in every case of cancer of the tongue; but, on the other hand, he does not venture to declare that it may not become a routine treatment at some future date, when we have more information regarding the proportion of cases in which glandular affection of the opposite side is likely to occur.

Case II. was also of a highly malignant type and showed an unusual rapid development. Of course it is too soon to say what the final outcome of this case will be.

Discussion.

DR. EMIL MAYER.—I recall a case some years ago which the late Dr. Asch and I had occasion to observe, of a woman who had a tumor directly under the tip of the tongue, which was removed and proved to be malignant, and in whom a few months after the entire left half of the tongue became involved. Dr. Murray, of New York City, removed the entire tongue, and the patient made a very complete recovery, living for some four years thereafter. What the eventual cause of death was I never had occasion to learn, but I do know that the patient had occasion to go abroad and visited some of the German surgeons, who were very proud of the fact that the work had been so thoroughly done, expressing themselves that they did not think they could do as well themselves as was done in this particular instance.

TWO CASES OF BONE IMPACTED IN THE LARYNX.

BY JOHN M. INGERSOLL, M.D.

FOREIGN bodies in the larynx usually cause such distressing symptoms that relief is hastily sought and in most cases promptly secured by the removal of the foreign body.

Quite a number of cases, however, have been reported in which a foreign body has remained in the larynx for a period of time varying from a few months to several years. One of the characteristic features of such cases is the fact that the larynx soon shows a remarkable tolerance for the foreign body. If there has been no interference with phonation or respiration, the primary laryngeal irritation may be entirely forgotten by the patient, and the persistence and severity of the symptoms caused by the secondary pathological conditions in the larynx or in the bronchi and lungs mask completely the primary cause of all the trouble.

In a case recently seen by us, we must frankly confess that the possibility of a foreign body in the larynx was not considered at any time until it was found at the autopsy.

The patient was a well-developed man, 37 years old. He was brought to Lakeside Hospital one night on account of marked inspiratory dyspnea. The difficulty in breathing had begun eight days before and had steadily increased. A few hours after his admission to the hospital he became cyanotic and it was necessary to do a tracheotomy at once. The following day an examination of the larynx revealed a complete bilateral abductor paralysis. As the cords were in apposition, no view of the inferior part of the larynx or the trachea was obtained. The larynx, above the cords, was inflamed and two ulcerations were seen. Moist rales could be heard throughout the chest and there was some increased dulness at the right apex. Otherwise the man was in good condition. He had had syphilis several years before.

It was thought that the laryngeal paralysis was due to pressure from a gumma, for in the absence of any demonstrable cause

this seemed to be quite probable, especially as the man had a syphilitic history, and so he was given iodide of potassium. This had no effect upon the laryngeal paralysis. The condition in the lungs grew steadily worse and the patient died of septic pneumonia about one month after his admission to the hospital.

The autopsy was made by Dr. David Marine, resident pathologist, to whom I am indebted for the following abstract of the post-mortem findings:

Anatomical Diagnosis.—1. Foreign body (bone) in the larynx, lodged in an ulcerated cavity situated posteriorly and transversely between the cricoid cartilage and the esophagus. 2. Consolidation with necrosis and liquefaction (gangrenous abscess) of the lower and middle lobes and lobular consolidation of the upper lobe of the right lung. 3. Chronic quiescent tuberculosis of the left apex. 4. Acute hemorrhagic bronchitis and trachitis. 5. Gumma of the right lobe of the liver. 6. Moderate acute splenic tumor. 7. Cloudy swelling of the liver and kidneys. 8. Chronic atrophic gastritis. 9. Tracheotomy wound. 10. Early arteriosclerosis. 11. Chronic thyroiditis.

In the posterior wall of the larynx, a little below the vocal cords, there was an ulcer, about two centimeters in diameter, opening into a cavity containing a piece of cancellous bone which extended two-thirds of the way around the larynx. The edges of the ulcer were cicatrized, showing that it must have existed for some time.

The piece of bone was irregularly triangular in shape, about five centimeters long and two centimeters wide in its greatest measurements, and its average thickness was about one-half of a centimeter. It was curved on its flat surface and the concavity was turned toward the larynx.

The esophagus was intact and its mucous membrane was normal. If the piece of bone had passed from the esophagus into the tissue around the larynx the esophagus would have contained some cicatrix.

It seems probable, therefore, that the piece of bone had fallen into the larynx while the patient was eating and then had worked its way through the posterior wall of the larynx into the position in which it was found at the autopsy.

The man gave no history of such an accident having occurred, but this is apparently the only possible explanation of the pres-

ence of the piece of bone in the larynx. The accident had probably occurred several months or a year before the laryngeal paralysis developed, and it had been forgotten by the patient, so that he did not attribute the difficulty in breathing to any previous laryngeal condition.

The bilateral abductors paralysis was caused by inflammatory induration and pressure of the bone on both recurrent laryngeal nerves. The pneumonia and gangrene of the lungs were due to the septic infection from the larynx.

The cicatrized edges of the ulcer and the position of the bone, buried deep in the tissue around the larynx, both bear evidence to the fact that the bone must have been in the larynx a long time.

The following case was seen by Dr. Dudley P. Allen, ten years ago, but has not been reported before.

The patient was a married man, 31 years old. He had always been healthy and had had no serious trouble with his throat. On the 12th of February, 1896, he noticed some difficulty in speaking and by the 16th of February he was unable to speak above a whisper. He began to notice some inspiratory dyspnea, which continued until the time of operation in July. At times the dyspnea was quite marked.

On April 13th he went to Hot Springs. A diagnosis of syphilis was made and he was given large doses of iodide of potassium and also had inunctions of mecury daily for forty days. He returned home on May 26th, and a laryngologist who saw him then thought that the condition in the larynx was malignant.

He entered Charity Hospital on May 31st, and a tracheotomy was performed to relieve the dyspnea. He was given antisyphilitic treatment again, but a careful study of the case led to the conclusion that it could not be specific; and there did not appear to be any positive evidence of its being a malignant growth of the larynx. The appearance of the larynx was difficult to explain. A grayish roughened surface could be seen below the vocal cords, and the latter were injected and thickened.

The question of extirpation of the larynx was considered, but before doing this it was thought wise to split the larynx in order to ascertain more definitely the exact nature of the disease. On July 2d the larynx was divided in the median line and an irregularly shaped piece of bone was found embedded in the right side of the trachea just below the larynx.

The bone was a little over two centimeters long and about one centimeter wide. In splitting the larynx the anterior attachment of the right vocal cord was somewhat injured, so that it was stitched into place with a catgut suture. The trachea was then united and the incision closed. The tracheotomy tube was left in place for about two weeks after the operation. It was then removed and the patient was discharged.

He did not know when the piece of bone had fallen into his larynx; he did not remember having had any attack of choking or severe coughing, nor had he been intoxicated and thus offered a chance for the bone to become embedded in the trachea without his being conscious of it. His relief after the operation was immediate and complete.

The patient was re-examined on May 3, 1906. He has been perfectly well since the operation. The larynx seems to be about normal. Both vocal cords move freely and meet each other in the median line. He says that he cannot speak as loud as he could before the operation and his voice tires a little more easily.

FRONTO-NASAL ENCEPHALOCELE.

BY F. E. HOPKINS, M.D.

ENCEPHALOCELE, or hernia cerebri, has interest for the rhinologist when it appears at the root of the nose. This interest is increased by the fact that to present itself in this region it probably must first enter the nasal cavity through the cribriform plate of the ethmoid, whence it protrudes externally through a fault, or failure of development, in the nasal bones. This course for the hernia would be anticipated from the anatomy of the region and is proven by the records of post-mortem examination in reported cases.

Cerebral hernia is of rare occurrence and that appearing anteriorly is especially rare. Mittendorf (*Medical Record,* 1890, vol. 37, p. 374) refers to ninety-three collected cases, of which only sixteen were of fronto-nasal origin. One of the theories of cerebral hernia assigns as a cause a failure of development in the cranial bones, and if the tumor appears at the root of the nose a failure in development in the nasal bones as well, with a consequent protrusion of cerebral contents. Another theory ascribes the cause to hydrocephalus occurring in the fœtus, when the yielding structures of the cranium are not able to withstand the pressure of the accumulating fluid. Still another suggests the prolapse of a fold of the dura through a sutural gap before union of the bones has taken place. Chamberly (*Bulletin Soc. de Anat. et Phys. de Bordeaux,* 1886, VIII, 66-72), who gives a full report of one of these cases together with pathological findings, sensibly suggests that in a given case doubtless more than one of these causes unite to produce the defect. In none of the recorded cases do I find reference to a nasal examination, but from the reports of the findings on post mortem it is probable that the tumor could have been seen in the upper portion of the nasal cavity had examination been made. In two of these cases the record shows that the hernia left the cerebral cavity through an opening in the anterior portion of the cribriform plate of the ethmoid

bone and appeared externally through defects in the nasal bones. In Chamberly's case the opening in the cribriform plate was of the size of a franc piece; in Demme's case (*Med. Ber. u. d. Thatigk. d.* XIII, 65-67, 1 pl.), the tumor being centrally located, the opening through the nasal bones was 2½ cm. long and ¾ cm. broad. These cases fell into the hands of general surgeons, and in neither of them is reference made to nasal symptoms. In one there was partial blindness from the overhanging masses of the tumor, and in the other from atrophy of the retina, due to pressure.

My own case differed from any I have been able to find recorded, in that the symptoms were almost wholly nasal. On September 20, 1905, Mrs. C., referred to me by Dr. Sweet of Springfield, brought to my office an infant aged 11 months. The child did not appear to be in vigorous health, yet was fully developed, and would not attract especial attention because of any deviation from the normal except for the fact that there was a small swelling over the right nasal bone. This prominence was present at the birth of the child and was diagnosed as a cyst. Relief was sought because of obstruction to nasal respiration in the right fossa and because of catarrh, also referred to this fossa. This complaint of catarrh deserves especial mention because of subsequent developments. The mother stated that a clear watery fluid seemed constantly present in the right fossa. This did not flow from the nostril to any extent, because of the blocking of the vestibule, but evidently drained backward into the child's throat. About three months previous to this time, according to the history given, polypi had been removed from this side of the nose, giving temporary relief, but since the recurrence of the growth the symptoms were more troublesome than ever. The right fossa was found to be completely occluded by a neoplasm projecting into the vestibule. The color and character of this tissue suggested malignancy, and I proposed operation under ether. The mother readily consented to this, and stated that she wished Dr. Sweet, who is a surgeon, to remove the external tumor over the nasal bone at the same time. The child was taken to the Springfield Hospital, and on the morning of September 26, 1905, was etherized. I suggested to Dr. Sweet that it would be wiser to do the intranasal work first, that the external wound and dressings

might be free from the possibility of disturbance. The neoplasm was found to extend into the fossa to a depth of one-half inch, and was apparently attached to the outer wall near the anterior end of the inferior turbinated. The small mass was removed with a cold wire snare and the supposed pedicle trimmed down smoothly with a pair of cutting forceps. Examination now of the deeper parts of the fossa by reflected sunlight revealed, to my great surprise, a globular tumor at the level of the middle turbinated about five-eighths of an inch in diameter, perfectly smooth, of a grayish color and semitranslucent. The removal of the neoplasm filling the vestibule had evidently lessened the pressure on this mass, and the external swelling was observed to be less prominent. Pressure made with a cotton-tipped probe against the globular tumor within the nose caused an increase in size of the external one, while pressure with the finger externally was conveyed to the mass within. Diagnosis of cerebral hernia was made, and, as no operation promised relief for the case, nothing further was done. Nasal respiration was restored, and as the external tumor was less pronounced the parents were much pleased with the results of the operation. Dr. Sweet and myself were less happy. After the removal of the small mass which occluded the vestibule, cerebrospinal fluid dripped constantly from this nostril at the rate of about four drops a minute. The child became ill on the fifth day, and at the end of two weeks died of meningitis. The following is a report by Dr. Jonathan Wright, to whom a section was submitted:

"It is difficult to make out from these sections the nature of the growth. I am disposed to think, however, that it is an edematous polyp. I see nothing malignant in it."

A few days later, after further history, he wrote:

"With your further history I should think very likely the tissue is a part of the meninges, as it contains more fibrous tissue and cellular elements than an edematous polyp. At one point the tissue is covered by columnar epithelium. The stroma itself is so macerated and the cells so shrunken it is difficult to be sure of anything, except that it is probably not a neoplasm of any kind."

This case is submitted as a curiosity rather than because such lesions contain practical possibilities of relief at our hands. The

rate of mortality from operation upon cerebral hernia is high, though less so than before the days of asepsis; and a recurrence often follows, even when the primary operation is successful. If the protrusion is into the nasal cavities the idea of operation is not to be entertained.

PAPILLOMA OF LARYNX FROM INHALATION OF FLAMES.

BY A. B. THRASHER, M.D.

IN the fall of 1900 Mr. R., of Cynthiana, Ky., consulted me for aphonia. Two months before he had been injured by an explosion of gas in the cellar of his drug store. He was rendered unconscious, and when carried to fresh air it was seen that his face and mouth were severely burned and his breathing impaired. He had a severe inflammation of the face, mouth, throat, and air tubes, apparently extending to the smaller bronchial tubes, from which he made a slow recovery. His voice had become more or less impaired, and when he came to me he was nearly aphonic.

The facial integument was still inflamed and red in patches. He had about recovered his general health, but his voice was growing worse. He would have dyspnea on exertion, which he attributed to his recent illness.

Examination revealed some redness of the fauces and of the epiglottis and aryepiglottic folds. Springing from the ventricles were a number of granular tumors which almost completely obstructed the view of the vocal cords. This was especially true of the anterior portion. A portion of the left cord near its attachment to the arytenoids could be seen, the inner edge of which was slightly reddened. Between the cords and just below, a couple of small reddish bodies could be seen during forced inspiration. I removed a portion of the supraglottic growth and submitted it to a pathologist, who reported that it was a papillomatous neoplasm with some intermixture of granulation tissue.

The growths were removed by forceps, a few at a sitting, the operation being stopped each time by rather profuse hemorrhage. I applied a ten per cent. solution of nitrate of silver to the base after each operation. After a few months the larynx was sufficiently cleared to see both vocal cords and his voice became stronger.

I lost sight of patient for some months, and on seeing him again his voice was quite normal and he said he was entirely well. I did not have an opportunity of examining his larynx.

This case was to me of considerable interest, and I therefore take a pleasure in reporting it to this body. The doubt that has been so often expressed as to the inflammatory origin of laryngeal papillomata seems to me to be cleared, as far as this one case is concerned. There was evidently a severe inflammation, caused from the burning gas, and the papillomata grew as a direct consequence from the inflamed mucosa.

TREATMENT OF CANCER OF THE LARYNX BY SUBCUTANEOUS INJECTION OF PANCREATIC EXTRACT (TRYPSIN--FAIRCHILD).

BY CLARENCE C. RICE, M.D.

I CONSIDER it wise to present these notes on the treatment of a case of carcinoma of the left vocal band by pancreatic injection (the so-called "trypsin treatment" of Beard), for the reason that the results observed would appear to leave no ground for doubt that this treatmnt exerted a direct action upon the growth and was accompanied by certain well-marked local and constitutional symptoms.

I desire to state that I am under great obligations to my friend, Mr. B. T. Fairchild, who has for many years devoted himself to the study of the pancreas gland secretions, and who, I am positive, has as thorough knowledge of the action of the pancreatic enzymes as anybody in the world. Mr. Fairchild has, many times during the past year, reiterated his sincere belief that the injection of trypsin was capable of exerting an unmistakable influence upon carcinomatous growths. In addition, I am indebted to him for the medications which have been prepared by himself in his own laboratory and also for the literature on this subject which he has sent me.

At the time the patient whose history I shall report was sent to me the cancer treatment by trypsin had already attracted my attention, and, owing to the sources from which the reports came, it seemed to me to be worthy of serious consideration.

Dr. J. Beard, University Lecturer in comparative embryology in the Research Laboratory of the Royal College of Physicians, Edinburgh, in a summary of his ideas upon "Germ Cells in Relation to Malignant Diseases"* state that "the nature of cancer as an irresponsible asexual generation or trophoblast has been known

*Lecture delivered January 20, 1905. Reported in Liverpool *Post*, January 21, 1905.

for two and a half years." He gives an account of his own work upon the history and origin of the germ cells, and states that it is established that these are pre-embryonic in origin, arising upon an asexual foundation or trophoblast, and that, by the self-sacrifice of one, an embryo is unfolded to contain and to nourish the other germ cells for a certain brief span of time; that a varying percentage of the germ cells failed to reach the right place in the body, and that these might be found in almost any organ and position.

In speaking of his earlier work upon the life cycle, he states that these researches have established that, prior to the appearance of an embryo or sexual form, there arises an asexual foundation, the so-called trophoblast, upon which the germ cells and the embryo come into being. In any normal case, at a certain definite period the embryo is able to suppress the asexual foundation, and the latter slowly degenerates. If, however, the embryo is absent, or very abnormal, the trophoblast may and often does become a very malignant form of cancer. The two generations have different nutritions, a fact of extreme importance, and the "digestion" of a cancerous growth exactly resembles that of the trophoblast of normal development.

The concluding portion of the lecture is devoted to a consideration of the embryological (as distinct from the medical) solution of the cancer problem. Beard declined to predict that the embryological solution of the problem of cancer would certainly turn out to be its medical solution. Owing to his recent results, he concludes that cancer had ceased to be a question for the embryologist, whatever difficulties it might present to the physician. "The mammalian embryo solved the problem of cancer ages ago."

Beard, after completing his investigations upon the critical period, that is, upon the change in nutrition which then invariably occurs, believes that he is able to state that the true problem of the cure of cancer is simply founded upon the antithesis of two digestions, of two enzymes or ferments. Beard's work of years past has revealed that at the critical period the embryo, complete in all its parts, begins to nourish itself by an alkaline pancreatic digestion and with a ferment known as trypsin. If this latter is wanting the asexual generation, the trophoblast, may become a growth of the most malignant type, but if present it becomes harmless and slowly degenerates. Clearly, then, he concludes,

since cancer is an irresponsible trophoblast, the ferment which brings about the degeneration of this in normal development ought to possess potency when directed against the cells of a malignant tumor. He believes that the problem to be solved in the cure of cancer is to find the enzyme or ferment capable of destroying a weaker one and so induce the degeneration of the tumor by simple atrophy. The whole story of cancer is but another example of that antithetic alternation which underlies all the phenomena of living things.

In the *British Medical Journal* of January 20, 1906, Dr Beard published a paper, "The Action of Trypsin Upon the Living Cells of Jensen's Mouse Tumor." These experiments were undertaken to determine, in the first place, three points: (1) The action of trypsin upon the living cells of a carcinoma, such as Jensen's mouse tumor; (2) to test the truth of the conclusion advanced by Beard in 1902 that cancer is an irresponsible trophoblast; and (3) the length of treatment and number of injections of trypsin necessary to destroy the tumor. In this paper Beard recounts his experiments upon two mice inoculated with the Jensen tumor, and, along with them, a third, uninoculated, control mouse.

Two mice inoculated with the Jensen tumor were treated with trypsin injection, a control mouse being placed with them. On the day after the first injection both mice were found in coma and quite cold; they recovered in a warm incubator and no like results were again encountered during the treatment. This great reaction was attributed to auto-intoxication by some other of the products of the tumor, and was also probably due to the very large dose of trypsin administered, which was enormous in proportion to the weight of the animal.

At the expiration of ten days one of the mice was found dead; the post mortem revealed no cause of death and it was attributed possibly to accident. Microscopical examination demonstrated that every single cell of the tumor was in degeneration, fully half of them being represented only by shapeless masses of particles, probably remains of nuclei, and all the rest were mere skeletons of cells; even these seemed in very many cases to be rapidly crumbling. The somatic tissues of this mouse, as represented by the leucocytes and connective-tissue stroma cells, were quite normal.

The second mouse was treated for twenty-two days—nine injections of trypsin made. At the expiration of this date one of the "control mice," not living with the "trypsin mouse," died of its tumor. It was then resolved to kill the "trypsin mouse." The tumor of this control mouse which died of its cancer was as large as the terminal phalanx of a man's thumb. In that of the "trypsin mouse" it was only as big as a lentil. "Microscopically, this latter apology for a tumor was in advanced degeneration, shrinking away to nothingness and quite harmless. It appeared probable to us that at the time we killed it its 'cure' from cancer was not far distant, and the microscopical examination confirmed this opinion. Even without further treatment the tumor would in all probability have been absorbed shortly or its remains cast out."

Professor Beard further remarks that, "though the number of experiments is small, already they have established what I knew they would. This degeneration of an asexual structure (a malignant tumor or trophoblast) under intestinal (tryptic) digestion, I have witnessed again and again in past years. The experiments were not needed to convince me that trypsin would cause a cancer to degenerate in the same way that it does the trophoblast, etc., in normal development. How such a conclusion can be arrived at is, I know, a mystery to many. It is solely by the use of the comparative morphological and physiological method."

Beard states that it appeared to him certain that "the action of trypsin upon the cancer cell is to pull down cancer albumin (a living substance) and that its action is direct and ruinous upon the trophoblast or asexual generation."

Whatever may be the outcome of what Beard calls the "medical aspect" of this theory as to the causation of cancer, the long continued researches of this embryologist at least entitle his views to respect, and they can be corroborated or disproved only by the work of specialists in this department of science.

It is to be observed that Beard exhibits a very remarkable confidence both as to the results of his experiments and as to their significance. The name of Shaw-Mackenzie has become connected with this treatment, from the fact that he employed trypsin injections in a few cases in which the results were so encouraging as to lead him to publish them. (See "The Nature and Treatment of Cancer," by John A. Shaw-Mackenzie.)

In the case to be reported I used the injection ("Injectio Tryp-

sini") prepared for me by Fairchild. He told me that the trypsin employed in the original experiments was not the isolated trypsin enzyme, but that it contained also a remnant of the starch-converting principle (amylopsin) of the pancreas, and doubtless—indeed necessarily—other constituents of the gland from which trypsin (Fairchild) was prepared. The "Injectio Trypsini" (Fairchild), however, it is explained to me, is prepared directly from the fresh pancreas gland, with the view to presenting not only the tryptic ferment but the starch-converting ferment, amylopsin, and these in their normal association with the soluble constituents of the gland, including its internal secretion.

The treatment of cancer by hypodermic injection is not new. The well-known work of Manders on the treatment of cancer by hypodermic injection of yeast was especially directed to the destruction of glycogen by the glycolytic agents. Manders makes no mention, however, of the intervention of a proteolytic enzyme.

Recently, since Beard's publication, Odier of Geneva has described "The Treatment of Malignant Tumors, and of Tumors in Process of Development, by the Injection of Glycolytic Ferment." * Odier attaches importance to the "likeness existing between the richness of a tumor in glycogen and its activity in the multiplication of the cells, so that the malignity of a neoplasm is in a general way the direct reason of its richness in glycogenic matter." Briefly, without attempting any discussion of Odier's theory and treatment, it simply ought to be said that he found it possible to make the glycogen disappear artificially, not only from the healthy tissue but also from the tumors, by the injection of his glycolytic preparation. He not only used the pancreas, but incorporated liver and muscle extract. He observed that "in healthy tissues the effects of the injection were particularly striking in new-born animals or those growing well; that among the animals afflicted with growing tumors the injection of the mixture in question has an influence on the neoplasm, even in attacking the glycogen, to spread physiologically in the rest of the organism; that there follows soon an arrest in the multiplication of the cells, so that the tumor seems to become a simple, inactive, foreign body. The histologic examinations of sarcomas, carcinomas, and adeno-

**Medecine Orientale*, No. 6, March 25, 1906. French Academy of Science.

mas after this treatment have shown that these tumors have been deprived of glycogen."

These experiments were made upon animals, but Odier believes that the treatment would be equally applicable to man, in the case of tumors, and, besides, he thinks the method might also be utilized in diabetes mellitus.

In concluding, he draws the attention of clinicians to the valuable information the study of the glycolytic power of the blood may give them, and suggests that the diminution or disappearance of this ferment goes to prove that the organism becomes a favorable ground for the development of the neoplasms, and he expresses the opinion that it is possible by preventive injections of glycogenic ferment to re-establish the normal equilibrium of the blood.

It is impossible at this time to seriously consider the very large amount of literature, in one way or another, bearing upon this subject; that is, the introduction of physiological agents, organic extracts, and enzymes into the body by intravenous and hypodermic injection. Under all the circumstances, I felt willing to accept the view that the consensus of opinion was that there was no known danger to be attributed to the action of a pure, sterilized solution of the pancreas enzymes, in proper dosage. I therefore determined to use the "Injectio Trypsini" and follow every precaution as to dose, introduction of the injection, and observation of the patient, etc. In this connection it is interesting to note that the uncomfortable or dangerous results mentioned by Beard and by Shaw-Mackenzie are by them regarded as a secondary result of the injection, viz.: the result of the absorption of the products due to the action of the trypsin upon the cancer cell and the substance itself, and to the dispersion of these in the system; and here the importance of the ferments (glycolytic) concerned in the conversion and metabolism of carbohydrate is of great importance and significance. It is of some significence also, in this connection, that the toxic effects produced by X-rays are said to have been attributed to the occasional disappearance of the tumors under the influence of the rays and the absorption by the system of the broken-down tissue products. Dr. William A. Pusey was willing to admit that the toxic symptoms might result from this

cause, but his personal experience seemed to indicate that their occurrence was of extreme rarity.*

In accounting for certain symptoms which followed the trypsin injections, we are strongly inclined to the view that they were due to the effect upon the system caused by the absorption of the tumor substance when attacked by the trypsin injection.

The following is the history of our case:

Geo. M. Age 70. Father died of acute bowel trouble at the age of 60. Mother died of cancer of the breast at age of 75. She had been operated upon two or three years before. There were twelve children in the family; nine died of consumption, ages 27 to 50. One was supposed to have died of cancer of the kidney, age 75.

Mr. M. had erysipelas forty years ago, which left a scar under the left eye. Six years ago he was sick in Paris for four weeks with an acute indigestion. He has had no other illness. Never has been a hard drinker or smoker.

History of the present ailment is as follows: In December, 1905, he began to get hoarse. There was no pain about the throat or cough. He was treated by his family physician. We first saw him March 7, 1906. We found that his left vocal cord was covered or involved throughout three-fourths of its length anteriorly with a dry, hard, grayish enlargement, having a nodulated irregular surface, presenting a typical carcinomatous appearance.

The surface was dry and apparently not ulcerated. The injections of pancreatic extract were commenced at once, and repeated every second day. Five minims diluted with equal parts of water were injected under the skin of the abdomen each day for the first ten days. After that the dose was increased to 7½ m. every other day, which was employed for one week; later 10 m. every other day; later 7½ m. every day, and finally 10 m. every day.

With these injections "holadin," which also is an extract of the pancreatic gland, was administered in three-grain capsules, one three times each day. The first effect of the trypsin injection that we noticed was a congestion and softening of the laryngeal growth. From gray it became red, from hard it became soft, and from dry it became moist. The posterior fourth of the growth sloughed away in small pieces, and had disappeared after two weeks treatment. The surface of the vocal band from which the slough had disappeared was congested but smooth, and there was

*Paper read by Dr. Charles J. White and Dr. Fred. S. Burns, of Boston, at the twenty-ninth annual meeting of the American Dermatological Association—"The Evolution of a Case of Mycosis Fungoides Under the Influence of Roentgen Rays."

no appearance of regrowth. The remainder of the growth was at all times soft and moist, and two or three pieces sloughed away, but when the patient went to Europe in the middle of May three-fourths of the length of the growth was still present. In elevation it had somewhat shrunken.

About a week before the treatment was stopped the hoarseness was suddenly increased, and we found that it was due to a marked congestion of the other vocal cord. Whether this was caused by an acute cold or by the effects of the medicines we could not tell.

We employed no other treatment. No doubt exists in our minds that the trypsin injections produced a very prompt and marked effect upon the growth. When the injections were given in the largest quantity, viz., 10 m. every day, constitutional symptoms were produced. The patient complained of feeling generally ill, headache, slight nausea, pain through body, slight rise of temperature, never above 100. At such times the injections were omitted for one or two days, and all disagreeable symptoms disappeared.

I should have said that the patient is in fine general health, quite as good as the average man of 60. We felt that we could always trace a direct relation between the size of the dose of trypsin and the degree of the congestion of the growth.

One other symptom was noted, that is, a tendency to congestion about the lips, sofe palate, and uvula. The congestion was followed by ecchymotic spots at these locations. We believe that they were undoubtedly caused by the trypsin injection.

We were very much encouraged for the first two or three weeks of the treatment, because, as we have said, one-quarter of the growth disappeared. During the later part of the treatment there was but little improvement and the patient was so anxious to go to Europe that we finally consented.

The growth is entirely confined to the vocal band and shows no tendency to attack the sides of the larynx above. We only allowed him to use a cleansing spray. He is to be away for two months and we hope to resume the treatment on his return.

This case seemed especially favorable for the trial of the pancreatic treatment because the growth is so localized; it had not been irritated by any form of local treatment, and the patient's general health is good. We have regretted that the patient's business has required him to talk a great deal. We feel that it could not have been merely a coincidence that the laryngeal growth commenced to soften and disintegrate in ten days or two weeks after the trypsin injections were commenced.

It would seem to me, that if we are able in any case to favorably influence any variety of cancer by the introduction of pancreatic injection of the entire pancreas secretion or in alternation or in association with a glycolytic injection free from trypsin (as sug-

gested to me by Fairchild), it would probably be necessary to adopt the systematic use of the treatment at proper intervals, in order to keep the system of the person with a disposition to cancer under the influence of the agent. It further seems to me evident that the pancreatic enzymes, hypodermically introduced, are highly potential agents, and under conditions practicable for their use have such curative possibilities as to justify a thorough and systematic clinical trial.

THE ETHMO-TURBINAL CELLS, CLINICALLY CONSIDERED.

BY JOHN O. ROE, M.D.

SINCE the clinical relations of enlarged middle turbinates and the attendant local and reflex disturbances caused thereby have received so much attention from rhinologists, it is somewhat surprising that the principal and most frequent cause of this enlargement—an expanded condition of the cellular structure of this bone, constituting a cell or cells of greater or lesser proportions—should have received so little attention.

Some writers incidentally mention this condition as an occasional anatomical peculiarity in connection with descriptions of the ethmoid region or turbinated bodies, but the first to study anatomically these cells of the middle turbinate was Santorini. Later special attention was called to them by Zuckerkandl, while Dupuytren seems to have been the first to emphasize their clinical importance. Among the recent writers Lothrop is the only one who has given them special consideration, in his most excellent article on "The Anatomy of the Inferior Ethmoidal Turbinate Bone" (*Annals of Surgery*, May, 1903).

The inferior turbinated bone does not normally contain air cells, as it is a distinct bone articulating with the superior maxilla, termed by Turner "the maxillo-turbinated bone." The middle and superior turbinated bones, however, are simply excrescences from the ethmoid projecting into the nasal passage, and, therefore, are composed of structures more or less cellular, like the other portions of this bone. The superior turbinate is very much smaller than the middle and rarely contains cellular spaces of any considerable size, while in the latter these air spaces are very commonly found. Turner says: "The inferior ethmo-turbinal, *i. e.*, the middle turbinated body, has a free lower border, and the anterior end of the free portion is sometimes hollowed out into a small air space called the turbinal cell (concha bullosa), which communicates with the middle meatus. This cell, however, may be absent upon one or both sides of the nose." This statement

would indicate that he regarded these cells as an almost constant anatomical condition, although he fails to consider them of special clinical importance.

There are, according to Lothrop, two theories among clinicians as to the formation of cavities or cells in the inferior ethmoidal turbinate, or middle turbinated bone:

"1. That these are closed, osseous cystic cavities produced by an inflammatory process giving rise to an exaggerated curling of the bony lamella until it has formed a bony cavity, or osseous cyst; in these instances there is claimed to be an absence of lining mucous membrane and a particular arrangement of osteoclasts and osteoblasts.

"2. That these cells already exist in the turbinate as normal structures, and may be the site of subsequent pathological changes."

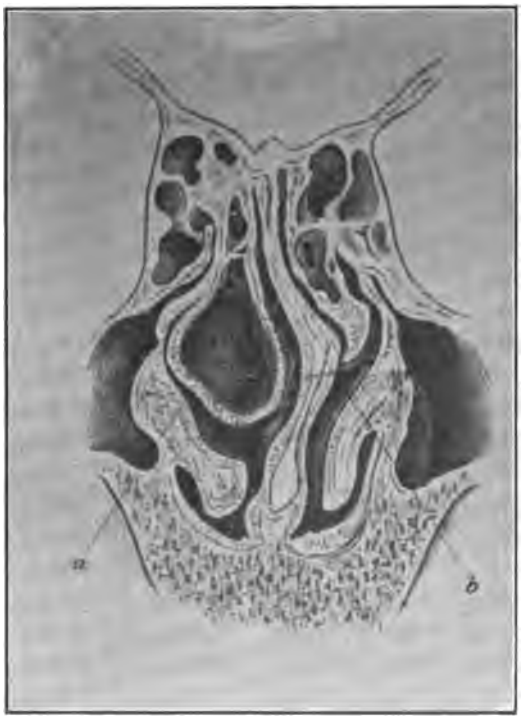
At birth the ethmoid bone has not developed cellular structures, but at about four or five years of age the small cells begin to appear, while at puberty the ethmoid cells are fully developed.

The cavities of the ethmoidal turbinate are found in all portions of this bone and are of various sizes, from the most minute cell to a dilated and expanded condition of the bone in which the entire interior constitutes one air cavity with thin, eggshell-like walls, as shown in the accompanying illustration. In the case of the small cells they are quite commonly multiple, whereas in the large cells, they are usually single, occupying a greater portion of the bone, particularly the anterior portion. These turbinal cells, like other ethmoid cells, are lined with mucous membrane, although no erectile tissue is found inside of the cells. Each cell normally also contains an ostium, opening from the upper and outer portion, as is usually the case with the other ethmoid cells. They may open into the middle meatus, or into the inferior ethmoid fissure, according to the location of the cell. In some instances the cells are found partly in the ethmoidal turbinate and partly in the ethmoidal body, forming a sort of communication; the ostii of these turbinate cells, however, as a rule do not communicate with the ethmoid cells proper, and are quite distinct from them.

In many cases the middle turbinate may be so distended by this cellular formation as to cause serious obstruction to the nasal passage in the ethmoid region, and also to obstruct the orifices or

ostii of the ethmoid cells. In some instances these turbinal cells so press against the surrounding structures that the slightest tumefaction will cause obstruction of their own ostii.

While these turbinal cells are in perfectly normal development, they are very often the indirect cause of serious conditions. The enlarged turbinate acts the role of a foreign body, obstructing the nostril, interfering with respiration, the sense of smell, and



Section showing (a) large middle turbinal cell, with (b) deviation of the septum.

causing the voice to be nasal. It gives rise to pressure symptoms, such as discomfort about the base of the nose and frontal headache; or reflex symptoms, as strabismus, photophobia, general symptoms of eye strain, often facial and head pains of a neuralgic character, and sometimes tic douloureux. It frequently forces the septum over to the opposite side sufficiently to obstruct

the other nostril (*vide* illustration), and causes more or less rhinitis, rendering the patient subject to frequently recurring colds in the head. Often the enlargement of this bone will lead the casual observer to regard it as a polyp; and many cases have been referred to me for the removal of polyps which consisted entirely of a very large middle turbinate, due to marked expansion of these turbinal cells. It is not infrequent that these cells are the seat of an empyema, the origin of which is not infrequently looked for in the accessory sinuses. In three cases operated upon, within as many weeks, in which the patients were each complaining of many of the symptoms above enumerated, attended with a purulent discharge from the upper part of the nose, I found this discharge proceeding from large turbinal cells, which soon disappeared after their removal and the use of an antiseptic wash for a short time.

It is also to be observed in this connection that accessory sinus disease of nasal origin is almost invariably associated with or caused by some obstruction of the nasal passage. This obstruction may be caused by polyps or other growths, or by hypertrophy, or by tissue formation that obstruct the ostii and interfere with the drainage of these cavities; or, as is most frequently the case, by an enlarged turbinate caused by an expanded condition of its contained cells.

Frontal sinus empyema is almost invariably due to an obstruction of the infundibulum by the middle turbinate, as illustrated by the necessity of removing the anterior portion of this bone in order to secure the proper drainage necessary to successful treatment.

The frequency with which these cells occur in the middle turbinate it is difficult to determine. Since the ethmo-turbinal bone is composed of structures normally cellular, it is undoubtedly the case that in many instances these cells go entirely unsuspected when not sufficiently distended to cause obstruction of the nasal passage. Lothrop, from a study of one thousand ethmoidal turbinates, obtained in the dissecting room and the Warren Museum of the Harvard Medical School, found these cells present in eighty-nine instances, or about 9 per cent. In a smaller series of cases, all of which were included in the above, the percentage was 18. Hence, he says, it was a matter of chance that the earliest specimens contained cells. In ten of the one thousand cases, or 1 per cent., both middle turbinates (in the same subjects) con-

tained cells. The cells, he says, are far more frequent in the right than in the left turbinate.

The above estimate is based on the findings of the dead-house, from the skulls in all conditions, both normal and pathological. If we consider cases only in which the middle turbinate is sufficiently large to fill the middle meatus, cells of greater or less size will be found in nearly all cases, as I have found to be the rule in the cases that have come under my observation.

In those middle turbinates in which no cells are present, it is normally seen as a thin, flattened bone, curved like a ploughshare, projecting about half way across the nares, but not in contact with the septum. But when the middle turbinate is seen as a rounded mass, with a firm, glistening appearance, occupying the entire space of the middle meatus, a cellular distention of the bone is to be suspected.

This condition, however, can be very readily differentiated from an enlargement caused by growths, cysts, or hypertrophy of the turbinated tissue, by means of the probe. In these latter conditions the soft, doughy feel readily reveals its character, while in the osseous distention the soft tissues are thin and drawn firmly over the bone, so that the feel with the probe is smooth, firm, hard, and unyielding.

In some cases enlarged turbinal cells will be found underlying some of the other conditions, which can then be known only by taking out a section of the enlargement. The presence of cells, unless very small, is easily determined by cocaining the part and puncturing the prominent portion with a very sharp, slender knife, which readily enters the cavity if it be present. If empyema of the cavity is present, pus will be seen escaping from the opening.

The treatment of these cases is essentially that which should be adopted for the treatment of hypertrophied middle turbinates, which consists in the removal of the enlargement, sufficient to remove all pressure between it and the septum, and to render the nasal passage free and unobstructed. This should be done even if the symptoms of active disturbance have not as yet appeared. Before attempting its removal, however, we should first seek for the presence of turbinal cells, and it is very rarely that we will be disappointed by not finding them.

When the cell is so large as to occupy the greater portion of the

turbinated bone, the removal of the outer wall is usually sufficient to take away all pressure, since the interior of the cavity is lined with mucous membrane, similar to that covering the outer portion of the bone, thereby leaving but a narrow rim of raw surface. In many instances, where the outer wall is thin, similar to an egg-shell, and the interior of the cavity normal, I remove this distended condition by simply forcing the outer portion of the shell inward, thereby collapsing it and obliterating the cavity, and thus removing the nasal obstruction without the necessity of a cutting operation.

In other cases, in which the cells are multiple and extensively diseased, the removal of the diseased portion or even the entire turbinate becomes necessary, and particularly if associated with diseases of the posterior ethmoid cells or frontal sinus. When neither of these latter conditions is present, the removal of the entire nasal turbinate should be avoided, for the reason that it opens up an avenue that may lead to the ready infection of these parts.

(*Candidate's Thesis.*)

LARYNGEAL PHLEGMON.

BY NORVAL H. PIERCE, M.D.

IT might occur to the reader's mind, after having perused this Thesis, that a more adequate title would have been "Infectious Phlegmon of the the Pharynx and Larynx" than the one chosen for it. Primary laryngeal phlegmon is a very rare occurrence, the laryngeal process being nearly exclusively secondary to pharyngeal phlegmon, and in reviewing the literature on the subject, that relating to the pharynx is so closely intermingled with that relating to the larynx the two can scarcely be dissociated. Another phase of the question is as to the identity of phlegmon and erysipelas in these regions. Those of us whose memory runs so far will remember the voluminous and, in some quarters, rather acrid controversy which followed the appearance of Senator's paper in 1888.

The writer's position in the present thesis is the one maintained by Kuttner, Beckaler, Onodi, and others, namely, that although phlegmon and erysipelas may be etiologically identical, and, as they affect the larynx, nearly always secondary to pharyngeal involvement, practical points of difference in pathology, prognosis, and treatment give ample reason for separating them and considering primary laryngeal phlegmon as a clinical entity. Up to the comparatively recent past the non-inflammatory edema of the larynx which occurs in nephritis, cardiac affections, etc., has been grouped with erysipelas and phlegmon; now we not only distinguish a difference between those edemas and the edema of infectious inflammatory nature, but we distinguish between non-inflammatory edema, as it occurs in cardiovascular diseases, and edema of angioneurotic nature, under which head may be placed those edemas which occur after the administration of kalium iodide.

The history of the development of our knowledge of these conditions may be divided into two periods: the prelaryngoscopic

period, and the period since the discovery of that valuable instrument. Since Hippocrates it has been regarded as a good indication when erysipelas "spread from within outward, and a bad sign when it spread from without inward." This retropulsion was studied more fully by later day writers, especially by Fabrizio d'Aquapendente, who presaged the theory of metastasis, but no especial mention is made of erysipelas of the pharynx or larynx until the eighteenth century. Dareac observed and gave a fairly clear description of a fatal case of erysipelas of the pharynx which occurred during an epidemic of erysipelas in 1757. After an interval of more than a half century, Bayle, Bouillaud, Cruveilhier, Sestier, Radcliffe, Ryland, Porter, Mackenzie, and others published observations which gradually established the separation of inflammatory edemas of the larynx and pharynx. In 1885 Massei published his report of fourteen cases of primary erysipelas of the larynx, and three years later (1888) Senator published his contribution on "Acute Infectious Phlegmon of the Pharynx." Both of these observers were anticipated by other authors; for example, Massei by Cuire in 1804, Porter in 1874 observed a case of fatal primary erysipelas of the larynx at the London Hospital; Senator by Cruveilhier and Bergen; nevertheless both papers mark milestones in the advancement of our knowledge of our subject. The controversy as to the phlegmonous process being identical with erysipelas of mucous membranes began with the discussion following Senator's paper, and has lasted to the present time.

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Etiology.—In so far as both erysipelas and phlegmon are caused by streptococci, they are identical (B. Fraenkel). Lately, however, there is a strong tendency on the part of bacteriologists to believe that there are different kinds of streptococci which are morphologically alike. It would seem as though this must be so when we consider the vast difference in the effects the various streptococci produced on the organism: in one case producing a localized abscess; in another a plastic inflammation of the submucous tissue with comparatively slight systemic manifestations, and ending in recovery, without the formation of pus; in another infiltration, necrosis and suppuration accompanied by grave systemic symptoms, sweeping on irresistibly to death. Or does the difference in virulence depend upon the condition of the individual's cellular elements, or in serum as manifested by the opsonic index? Future research must determine these matters. In all

probability these micro-organisms are normally present in the buccopharyngeal cavity.

The portal of most frequent entrance in primary laryngeal phlegmon is the region of and about the epiglottis. Massei's experience leads him to regard the lingual tonsil as the most frequent point of entrance in laryngeal erysipelas. Not only is the epiglottis the point most exposed in the respiratory current, but on account of its prominence and position it is peculiarly subject to chemic, thermal, and mechanical insults, incident to deglutition.

No age is exempt, an infant eleven months old and a woman of eighty years appearing in the reports of cases. As to sex there in some doubt. Gerber collected 33 cases, presumably of acute laryngeal phlegmon (though he does not specify), in which 23 males and 10 females were affected. Occupation bears a marked relationship to its etiology; those who come in contact with septic processes, such as nurses and patients confined to septic wards, are especially liable to acute infectious processes in the pharynx and larynx (Porter).

Pathology.—In the swelling caused by erysipelas of the larynx cellular infiltration occurs to such a slight degree as to be negligible and unimportant. In phlegmon, infiltration plays a most important role. In erysipelas the cellular elements of the tissues remain intact. In phlegmon from the very beginning of the process, necrosis is marked (Virchow). It is possible for the former process to pass into the latter and to have mixed forms (Bryson Delavan, Baruch, Henning, and others), but this does not militate against the necessity of keeping the two separated because of practical clinical utility. Further, the edematous swelling of erysipelas may be readily resorbed and leave no lasting effect on the tissues. On the other hand, tissues that are the seat of phlegmon, especially as it affects the larynx, are rarely restored to their integrity, but are replaced by scar tissue.

It is in the course of the two forms that their dissimilarity is most marked. In erysipelas the greatest danger is asphyxia. The systemic factors are relatively negligible, and if by intubation or tracheotomy the respiratory function can be maintained a reasonable hope of recovery may be entertained. In phlegmon the systemic factors are by far the most dreadful, and in the majority of cases death from heart failure and pulmonary edema (sepsis) occurs before critical dyspnea appears. The former remains a

local disease, which affects the organism as a whole principally through the absorption of the toxins from the original nidus. In the latter septico-pyemic infection, of trachea, bronchi, lungs, pleura, pericardium, spleen, kidneys, etc., is found on section to be the rule.

Their initiatory symptoms are similar. Both begin suddenly, frequently inaugurated by a chill, and followed by a high fever. According to Gerhardt and Zeigler, a prodromal fever is characteristic for erysipelas, which occurs twelve hours before the subjective sensation and twenty-four hours before the objective appearances. Dsyphagia, which early becomes lancinating, appears, so that the patient expectorates the buccal secretions rather than swallow them. The voice may be quite hoarse or only clouded. Early dyspnea supervenes in erysipelas, often within a few hours. Not so in phlegmon, which may proceed to a fatal issue without imminent danger of suffocation occurring. On the other hand, the sensorium is more liable to be affected (somnolence, delirium). In both, pain is caused by pressing on or moving the larynx. The cervical lymph nodes are early involved, and swelling of the neck is more liable to be an early symptom in phlegmon. Inspection of the pharynx in primary laryngeal phlegmon gives no clue to the situation of the disease. The mirror usually shows in erysipelas an epiglottis red, erect, and glistening (Barnes), which may obscure the view of the rest of the larynx. This same character of swelling extends to the aryepiglottic folds and false vocal cords, but the interior of the larynx can rarely be seen. In phlegmon the laryngoscopic picture is quite different. In the early stages it frequently presents the same appearance as early tuberculosis (Sokolowski); and later may present the appearance of a ruptured dermoid cyst. Here we have infiltration and the swelling is not so great. In erysipelas the swelling is much more marked, in comparison to the duration of the disease, and is edematous. In erysipelas the color of the swelling is more of a livid bluish tone, that of phlegmon a waxy, pinkish gray. The surface in erysipelas is smooth, glassy, or glistening; in phlegmon dull, lustreless, and minutely roughened and flecked with mucopurulent discharge. The wandering character of erysipelas may produce fatal results by a downward course, invading the trachea, bronchi, pleura (Zulzer), or upward to the meninges, to the cranial cavity, causing fatal meningitis (Von

Stein). Phlegmon does not so extend, but produces death in an entirely different manner (Von Feinsten).

The prognosis in phlegmon is extremely grave. It is difficult to accept Kuttner's optimistic belief that many cases recover which are not reported because the observers doubt their diagnosis. Certain it is that the great majority of phlegmons of larynx or pharynx end in death; the few that have recovered have done so after protracted suffering and grave intoxication.

The writer takes this opportunity of putting on record a typical case of primary laryngeal phlegmon, which he observed at Michael Reese Hospital in 1904.

In the early morning of February 13th I was called by Dr. Greensfelder to see Miss L., surgical nurse in charge of the operating room at Michael Reese Hospital. She had complained on the previous morning of a slight soreness in the throat on swallowing. The history of a chill was indefinite. The pharynx had been examined and, finding nothing visibly wrong, a simple gargle had been ordered, and the matter dismissed as unimportant. I wish to make this phase of the disease marked in order to impress the insidiousness with which this fatal disease may begin. About sixteen hours after her first complaint I found a well-nourished woman, past forty, propped up by pillows in bed to a semirecumbent position. The expression of her face was not anxious but quite calm, except when she swallowed, when a grimace of pain spread over it. She expectorated the superabundant saliva rather than suffer the dysphagia. The voice was slightly clouded but not hoarse. The sensorium was not normal. The change in this regard might have escaped the observation of one not so well acquainted with the practical matter-of-fact woman as ourselves. There was a certain nonchalance, a forced smiling, a casting of the eyes downward at the bedclothes, which she folded and picked. The temperature was 104, pulse 104, respiration 32. She complained of headache, pain in the throat, especially marked on the right side, and made lancinating by deglutition. Examination of the pharynx disclosed nothing but a chronic bilateral pharyngitis. She opened her mouth readily and freely.

Laryngoscopy: The base of the tongue (lingual tonsils) was quite normal. On the right side of the epiglottis, beginning at the tip and extending along the edge to the aryepiglottic fold, was an infiltration of a dirty pinkish-gray color. The right false vocal band was very slightly swollen, but not markedly hyperemic. The mucosa of the entire larynx gave one the impression of grayish lividity, of being lusterless and minutely roughened; little

flakes and streaks of muco-pus lay here and there. The vocal bands were slightly hyperemic but not swollen. In fact, there was but little swelling anywhere; that on the epiglottis was very slightly elevated and disappeared imperceptibly into the surrounding tissue.

Later in the day the temperature dropped two degrees. Delirium and dysphagia increased. The infiltrations spread to the left side of the epiglottis, down the aryepiglottic fold to the vestibulum during the next twenty-four hours; then via the pharyngo-epiglottic fold to the sinus pyriformis on either side. The view of the vocal cords was entirely cut off on the 17th of February, but symptoms of obstruction did not become marked until a few hours before death, which occurred at 11:05 A. M. on February 17th, so obviously from general sepsis and heart failure (pulmonary edema) that tracheotomy was deemed superfluous at a consultation of the attending surgeons of the hospital.

On February 16th the gland over the cricothyroid ligament became swollen. This corresponds with the extension of the process below the vocal cords, and tends to corroborate Poirier's (*Bull. Soc. Anat.*, 1887) researches on the region drained by these nodes.

The temperature ranged from 103 to 104, but with slight intermissions, when it fell once to 101. The pulse ranged from 100 to 140.

The delirium gradually passed into lethargy and this into complete unconsciousness long before the dyspnea became apparent. The urine was loaded with urates, but that passed during the first two days contained no sugar or albumin. Leucocyte count, 24,000 on the second day. Cultures taken from the interior of the larynx at various times give streptococcus in almost pure culture, whose morphological cultural characteristics correspond with those of streptococcus pyogenes aureus. No autopsy was permitted.

Treatment.—Those who come in contact with the sick, and especially those who are much about pus cases, should habitually use a prophylactic mouth wash and gargle. This applies peculiarly to nurses and internes, whose devotion to duty is too often accompanied by insufficient out-door exercise and fresh air, and renders them especially liable to throat infections. For this purpose I have been recommending for some years past the following formula:

℞ Acidi salicylici..... ʒ iv.
Spts. ætheris nitrosi.....
Alcohol .....aa ℥ i.
Formalin .....(1-10) ℥ss. to ℥i.
Ol. caryophil..... ʒ i.
Glycerin .....q. s. ℥ iv.

A half teaspoonful of this to a half glass of hot water is used as a gargle and mouth wash whenever necessary.

The treatment of either erysipelas or phlegmon by injection of antistreptococcus serum has been followed by results that, to say the least, are disappointing. Our case of laryngeal phlegmon received two injections, one twenty-four hours from beginning of the disease, and one more twenty-four hours later, without in the slightest degree changing the local or general conditions one way or the other.

Our treatment must therefore be symptomatic, and thus we have three principal indications: 1st, to combat the dyspnea; 2d, to keep up strength and combat heart failure; 3d, to assuage the dysphagia. In erysipelas the first indication is most imperative; in phlegmon the second. Therefore in erysipelas we may be compelled to resort to tracheotomy or intubation very early in the course of the disease. It should never be put off, but when the laryngoscope discloses a dangerous swelling operative efforts to maintain respiration should be decisively made. In the majority of cases of phlegmon death occurred before dangerous dyspnea developed. Blebs of the mucous membrane should be opened if they are situated in a position to interfere with respiration; otherwise they are unimportant and may be let alone. Whenever pus is demonstrated efforts should be made to liberate it at the earliest possible moment. Hot and cold applications to the neck have been recommended. Mattei is especially enthusiastic in the employment of cold. According to Paralowsjy's experiments, the employment of such cold applications tends to delay or arrest the multiplication and development of streptococci. It may be used externally in an ice bag, and small ice pills may be dissolved in the mouth. Bryson Delavan employed a spray of zinc chloride and an alkaline solution of quinine, together with steam inhalations of antiseptics. Mattei employs swabbing the throat with 1-2000 corrosive sublimate solution.

In our case adrenalin solution with and without cocaine was employed with very slight effect on the distressing local sensations. The strength was kept up by rectal alimentation, the use of coffee and brandy and continuous rectal normal salt injections, and the hypodermic use of cardiac stimulants. Oxygen was employed toward the end when the first symptoms of dyspnea developed.

But in spite of all the patient died five days from the time she first complained of pain in the throat.

Bibliography.

1. Hypocrates. Predict., I., iii.
2. d'Aquapendente. Opera Chirurgeca, Pars Prior, lib. I, chap. iii.
3. Kuttner. Virchow's Archiv., CXXXIX, p. 117, 1895.
4. Onodi. Archiv. f. Laryngology, 1904.
5. Darluc. Jour. d. Med. et de Pharm., July, 1757.
6. Bayle. Traite de l'angine laryngee œdemateuse, Paris, 1852.
7. Bouillaud. Recherches, Archiv. gen. de med., 1825, vii, etc.
8. Cruveilhier. Anat. path. du corps humain, I. lib. 5, pt. ii, p. 10.
9. Sestier. Traite de l'angine laryngee œdemateus, Paris, 1852.
10. Radcliff. Lancet, vol. I, p. 536, 1835.
11. Ryland. Diseases and Injuries of the Larynx, London, 1837, p. 69-73.
12. Porter. Mackenzie's Diseases of the Throat and Nose, p. 147 (1880).
13. Mackenzie. Diseases of Throat, Am. Edition.
14. Massei. Rev. clinica e terep., VII, No. 1, 1885.
15. Cuire. These de Paris (De l'Erysip. du Pharynx, 1864, No. 136).
16. Bergeu. Preussich. Verein., 1855.
17. Senator. Berliner klin. Wochens., 1888, No. 5, p. 77.
18. B. Frankel. Baumgarten's Jahrbuch, vol. V, p. 44.
19. Gerber. Heymann's Handbuch, vol. I, Part ii, p. 1265.
20. Virchow. Berliner klin. Wochens., 1888, No. 5, p. 80.
21. Delavan. N. Y. Med. Jour., 1885.
22. Baruch. Berl. klin. Wochens., 1888, No. 13, S. 256.
23. Henning. Chicago Med. Times, 1887, March.
24. Gerhardt. Chariteannalen, vol. XII, p. 208.
25. Zeigler. L. c. ibid.
26. Sokolowski. Gaz. lek., 1888, Nos. 20 and 21.
27. Zulzer. Handbuch d. spec. Path. u. Therap., vol. IV, p. 285.
28. Paralowsjy.

MIXED TUMOR OF THE SOFT PALATE. REPORT OF A CASE.

BY T. H. HALSTED, M.D.

CARCINOMA and, less often, sarcoma are frequently met with in the soft palate and tonsil; small pedunculated papillomatous growths are not at all uncommon on the uvula, sofe palate, and pillars of the fauces. Adenoma, angioma, dermoid tumors, cysts, polypi, and pretty nearly every kind of new growth has occurred in the fauces; nevertheless, any form of benign neoplasm, other than the papilloma, is of such rarity in the soft palate or tonsil that it would seem to be worthy of note and report.

Bosworth states in the last edition of his book that there are in literature but seven cases of fibroma in the fauces. Adenoma, or one of its mixed varities, as adenofibroma, adenoenchondroma, or other variety, is apparently more often found in the soft palate than any of the other non-malignant tumors, papilloma alone excepted.

CASE. Mr. C. C., age 55 years, merchant, was referred to me in July, 1905, by Dr. E. J. Wynkoop. The patient complained of a sore throat and hoarseness, which had existed for a few days. The voice was thick and somewhat muffled as well as hoarse. Some nasal obstruction of the left side. No earache or deafness.

He gave a history of similar attacks at intervals of two to four weeks during the past two years, and at longer intervals for the previous ten or fifteen years. He has repeated attacks of acute bronchitis during the winter months, rarely in the summer. There was more or less constant hawking and clearing of the throat, aggravated during acute exacerbations. Excepting during the acute attacks, the voice was clear.

On examination the left tonsil was reddened; there was decided swelling in the peritonsillar region, quite like a quinsy in appearance; the uvula was swollen and slightly edematous; there was an acute nasopharyngitis and laryngotracheitis. On palpation the tonsil and peritonsillar mass were very hard. Local applications cleared up the acute inflammation, and in two or three days he was back to what he called his normal condition.

There was now no soreness or pain in the throat, no hoarse-

ness, the voice clear. There was the usual hawking and clearing the throat, with some nasal obstruction on the left side; no pain in or referred to the ear, and no deafness.

The examination revealed the same swelling on the left side of the fauces, the only difference now being in the absence of the superficial redness of the tonsil and uvula. The appearance was that of an enormously hypertrophied tonsil buried between the pillars and almost entirely covered by them. The swelling was greatest in the soft palate above the arch, and was pushing the posterior pillar backward and largely obstructing the left side of the nasopharynx, extending to the Eustachian orifice. The mass was as hard as a stone and its surface nodular on palpation.

There was no external evidence, in the neck, of the growth, either by swelling or on palpation. No glandular enlargement, no history of bleeding. He denied syphilis. He has had for many years a gastric disturbance, and is of a very marked neurotic temperament. Beyond the repeated acute attacks of tonsillitis and laryngitis, he is in very good health.

He has known of the swelling in the throat for at least twenty years, and during this time has been under the observation and the care of many laryngologists, both at home and in New York City, and has consulted a number of general surgeons. Eight members of this Association have been consulted by him during the past five years, while several other throat specialists have either treated him or been consulted by him. Various diagnoses have been made (calculus in the tonsil, fibroma, cyst, and other forms of dense benign tumors), while several eminent laryngologists have believed it malignant. The majority advised removal, while two or three were most strenuous in advising against any surgical interference whatever, on the ground apparently that the growth was either malignant and would recur, or, if not malignant, the danger of a fatal hemorrhage during the operation was so great that an operation could not be undertaken with safety, and the discomfort was not sufficient to warrant the risk.

With these conflicting opinions he was left much at sea, and did not enthuse when my opinion was given that the growth was not malignant and advised removal.

During the next four weeks he came to me for treatment of three acute exacerbations of tonsillitis (left side) and laryngitis. They all subsided in the course of two or three days, only to recur in a week or ten days. He considered operation but postponed it.

On his return from the White Mountains in the later part of September he said that on several occasions of late he had had some hemorrage from the throat, about a teaspoonful each time. Examination revealed no change and no apparent increase in size. There was no ulceration. I again urged operation, but before deciding he concluded to consult other specialists and general

surgeons, and saw Drs. Myles, Coakley, McKernon, and Samuel Lloyd, of New York, and Dr. Jacobson, of Syracuse. These gentlemen saw him separately and all concurred in believing the growth to be non-malignant, but were uncertain as to its exact nature, most of them thinking it in all probability a fibroma, and one a calculus. All agreed that the growth should be removed, two through the mouth and two by external pharyngotomy. Dr. Myles had seen the patient three and one half years before, and said there was no appreciable increase in size during this period.

October 3, 1905, under cocaine applied externally and by submucous injection, I removed the growth. It was found that

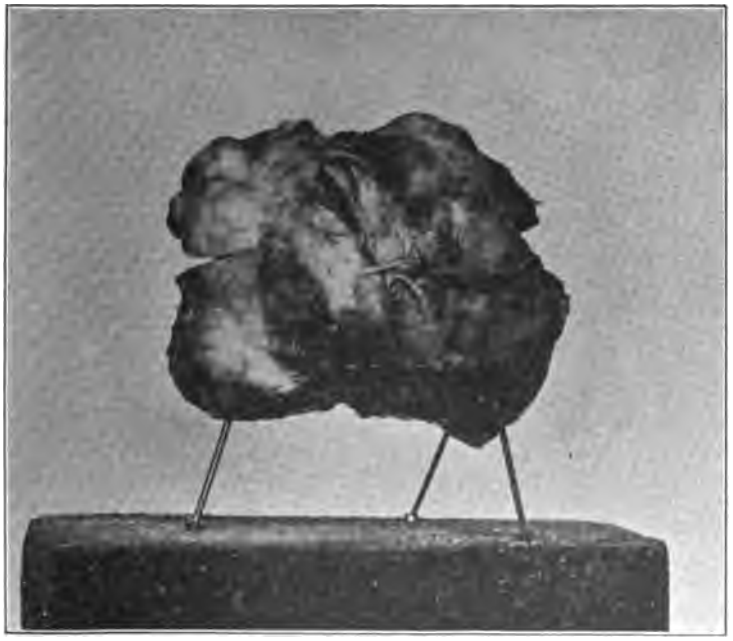


Fig. 1. Tumor, full size.

the tonsil was simply superposed upon the tumor, which, after removing the former, showed up as a yellowish glistening mass lying external to the tonsil and apparently independent of it. I separated the pillars from the growth with a dull-pointed dissecting tonsil knife, but largely with the finger, and when the tumor seemed free passed a large snare around it, supposing the growth was entirely enclosed by it. It cut quite easily, but the growth had been simply bisected, the remaining half being easily shelled out with the finger. The hemorrhage was comparatively

slight but the growth left an enormous cavity, and on the posterior wall of it stood out for about two inches vertically a vein as large as a goose quill, the wounding of which would have produced a serious hemorrhage. Dr. Wynkoop was present to assist in any such emergency should it occur.

The tumor, somewhat oval in shape, measured 7 cm. in its vertical diameter by 5 cm. by 4 cm. in its other diameters. It was encapsulated, as hard as a bone, and to the fingernail on its cut surface felt like bone or cartilage, and in its center were several small cystic cavities which probably contained fluid, though none was seen, as it must have escaped when the growth was cut through with the snare.

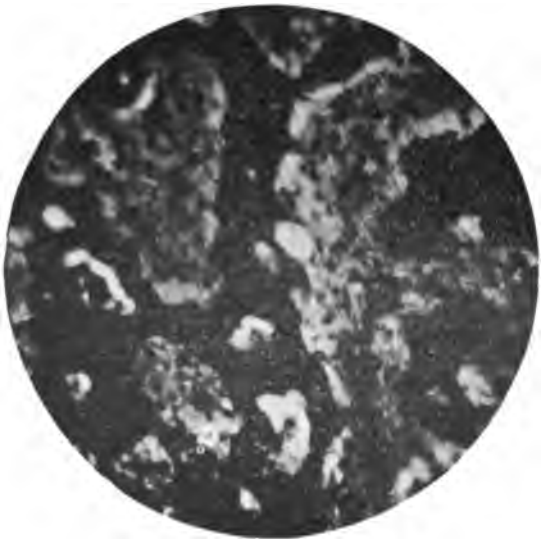


Fig. 2.

The patient made a rapid recovery, the cavity being completely obliterated in two weeks, the soft palate and fauces looking like the other side within a month.

May 24, 1906, seven months after operation, he came for examination at my request. There is no evidence of any return of the growth, and one could not tell from appearances on which side the fauces the tumor had been, excepting that there is a small depression the size of a pea between the pillars at the arch, where the galvanocautery had been used ten days after the operation. He went through the winter with but one attack of tracheitis, has had no tonsilitis or sore throat since operation, and has gained twenty pounds in weight. He states that he is in better condition than he remembers ever to have been before.

I am indebted to Dr. H. S. Steensland for the following report as to the microscopic findings:

"The tumor is a typical example of the mixed tumors of the salivary glands, the so-called cylindromata. The specimen, fixed in formalin, consists of the encapsulated tumor. It is irregularly ovoidal in shape, 7 cm. long, and hard, and evidently originated in connection with the parotid gland (possibly an aberrant portion) or in connection with mucous glands.

"Histological examination: The tumor consists of connective tissue in which there are areas filled with epithelial cells. It is surrounded with a definite capsule. The stroma predominates considerably over the parenchyma. The stroma consists of rather a loose connective tissue, with a tendency here and there to a cartilaginous or mucoid appearance, and contains relatively few connective-tissue cells. In some parts there is considerable hyaline degeneration of the connective tissue. A few small areas infiltrated with lymphoid and plasma cells are seen. Where the connective tissue has a cartilaginous or mucoid appearance it stains faintly blue with hematoxylin, indicating the presence of mucin.

"The epithelial cells vary in form, but are largely polyhedral and low columnar. The latter cells are largely at the periphery of the alveoli. The neuclei are uniform in size and are round or oval in form. They contain nucleoli. Karyokinetic figures are rare. In many of the alveoli there are spaces. Some are filled with stroma and represent projections of the stroma into the epithelial masses. These spaces as a rule are rounded in form, though sometimes they are irregular. They may be seen to communicate with each other and with the surrounding stroma.

"Other spaces of a different character appear to represent glandular lumina and occur in considerable numbers. They vary in size from the diameter of a red corpuscle to three or four millimeters. These spaces are lined with low columnar epithelium and contain hyaline material staining with eosin, evidently a secretion.

"The blood vessels of the stroma are relatively few in number. No necrosis is evident. The stroma contains groups of fat cells."

The salivary glands, especially the parotid gland, are often the seat of these peculiar tumors. They occur also in the lacrimal glands. This has been pointed out by Verhoeff, and his views in regard to their origin and nature are here followed. "They have been regarded as endotheliomata, but are really of mixed ectodermal and mesenchymal origin. The parenchyma is derived probably from the glandular epithelium and not from endothelium. The cartilage, mucous tissue, and bone, that frequently are present, probably represent an atypical development of the mesenchyma."

Wood, in the *Annals of Surgery* for January and February, 1904, has investigated the mixed tumors of the salivary glands, reporting on the histology of 59 tumors from the salivary glands, lip, and pharynx, 5 only of this number being from the soft palate or pharynx. He states that 95 per cent. of the tumors of the salivary glands are of this mixed type. Only 55 per cent. were permanently relieved by extirpation, 33 cases being cured by operation following recurrence. After incomplete removal he finds that the tumor is apt to take on more rapid growth. These mixed tumors practically never give rise to metastases, either within the regional lymph nodes or elsewhere. They have been described as occurring in the palate, in the antrum of Highmore, and in the nose, and less frequently in other regions, such as the skin.

Ribbert suggests that in some cases they originate in connection with glands resembling the salivary glands, such as the mucous and sweat glands, and Dr. Steensland suggests that the tumor removed from my patient possibly originated from an aberrant portion of the parotid or from a mucous gland.

(*Candidate's Thesis.*)

THE LYMPHATIC DRAINAGE OF THE LARYNX.

BY D. CROSBY GREENE, JR., M.D.

THE lymphatic circulation of the larynx derives its importance clinically from its role as the chief avenue for the spread and dissemination of cancer as well as of infectious processes of bacterial origin.

Given the starting point of a cancer, the direction of its spread may be largely determined by the course of the lymphatic circulation from that point. With this fact in view, I have made injections of the lymphatics at various parts of the larynx for the purpose of observing the course of the lymph current from given parts.

The researches of Most,[1] Cuneo,[2] and Roubaud[3] have established definitely the general anatomy of the lymphatic ciculation of the larynx, which may be described as follows:

The lymphatic trunks which take their source from the larynx are derived from a network of radicles which extend throughout the larynx beneath the mucous membrane. This network is divided by a horizontal plane at the level of the vocal cords into a supraglottic portion and an infraglottic portion. The supraglottic portion includes the lymphatics of the epiglottis, arytenoids, ventricular bands, ventricles, and vocal cords. This network is continuous throughout these areas. Over the upper portion and posterior surface of the epiglottic the network is fine and the meshes are far apart. In front and lower down, especially at the sides, the meshwork is denser and the strands thicker. Over the arytenoids, ventricular bands, and throughout the ventricles the lymph channels are thick and closely apposed. In the vocal cords, however, the network is very fine and sparser than in any other part of the larynx. The infraglottic meshwork is finer than that above the vocal cords, but by no means as fine as that of the cords themselves.

The lymph from these radicles is collected into trunks which leave the laryngeal cavity at certain definite places:

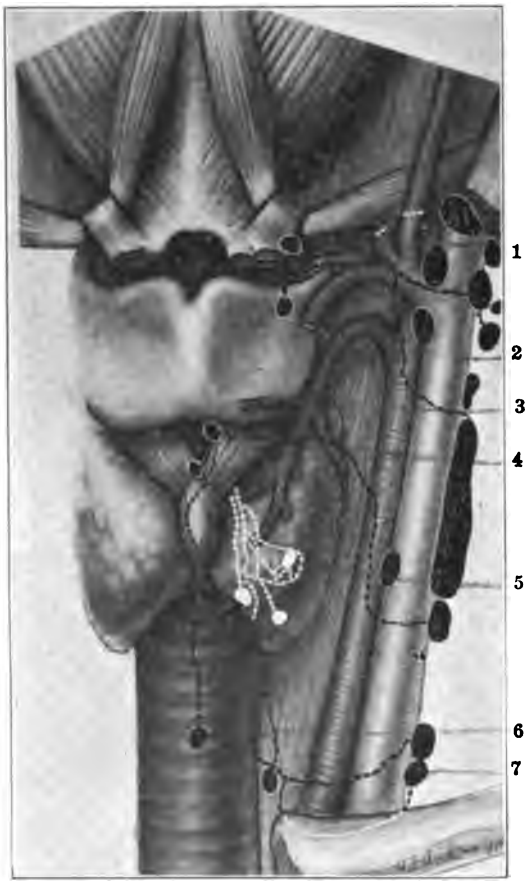
In the upper part of the larynx the only place of egress is through the thyrohyoid membrane. The lymph vessels of the upper network assemble in the vicinity of the aryepiglottic folds into several trunks, three to six in number, which leave the larynx through the above-mentioned membrane near the superior thyroid artery, a corresponding group on either side of the larynx.

These trunks course outward and backward, more or less in relation to the superior thyroid artery, to the carotid region, terminating in nodes which lie along the surface of the internal jugular vein at the level of the bifurcation of the carotid. The upper trunk of this group often runs backward, after emerging from the thyrohyoid membrane, along the hyoid bone to the tip of the lesser cornu and thence outward to a node lying on the inferior aspect of the posterior belly of the digastric muscle. The lower trunks of this group may run by a lower course outward and downward into glands in the chain lying on the surface of the internal jugular vein, below the level of the carotid bifurcation, sometimes as low as the lower border of the lateral lobe of the thyroid gland.

The collecting trunks of the infraglottic network are divided into an anterior and a posterior division. The anterior division consists of three or four small trunks which pierce the cricothyroid membrane in the median line and terminate in small glands which lie in the median line at uncertain locations. The uppermost of these is fairly constant and lies in the V-shaped space on the cricothyroid membrane formed by the inner borders of two cricothyroid muscles. A second gland is sometimes found on the thyroid isthmus and a third on the anterior surface of the trachea. These two are denominated respectively the prethyroid and the pretracheal glands. They may receive trunks from the anterior infraglottic group. Efferent trunks from these glands run to the before-mentioned chain of glands lying on the anterior external surface of the internal jugular vein.

The posterior division of the infraglottic collecting trunks, three to five in number, penetrate the cricotracheal membrane at or near the line of junction of the cartilaginous and membranous portions of the trachea and run into a chain of glands, two to five in number, which lie along the course of the recurrent laryngeal

nerve, known as the recurrent chain. From these glands run vessels communicating with the lowermost glands of the internal jugular chain and a few to the supraclavicular group of glands.



Semidiagramatic sketch of laryngeal lymphatic trunks and glands into which they empty. (After Most.)

(1) Superior collecting trunks. (2) Internal jugular vein. (3) Carotid artery. (4) Efferent trunk from prelaryngeal gland. (5) Recurrent chain behind lateral lobe of thyroid gland. (6) Pretracheal gland. (7) Lowest gland of internal jugular chain.

The lymphatic drainage from all parts of the larynx thus eventually leads into the chain of glands lying under the sternomastoid

muscle, along the surface of the internal jugular vein or into the supraclavicular glands. The prelaryngeal, prethyroid, and pretracheal glands are merely intercepters of the current on its way to these glands.

These points in the anatomy of the lymphatic circulation of the larynx being established, I have endeavored to trace the current from the radicles to the trunks leading out of the larynx by injecting the former at various points and following the course of the injection mass.

Technic.—In making injections for the purpose of demonstrating the network of origin, the most effective material was mercury. Injected under considerable pressure, it distends the finest of the vessels and brings them out clearly. It does not show the relative caliber of the collecting trunks and the vessels of origin, because the former, having relatively firmer walls, do not become so distended by the injection and therefore look relatively smaller. For demonstrating the course of the collecting trunks a saturated aqueous solution of Prussian blue was more effective, because it could be injected under less pressure and because it did not run out so much from the cut edges of the larynx where the lumina of the vessels were exposed. The more complicated injection masses of Gerota did not prove more satisfactory in my hands than these simple preparations.

The syringe used was an ordinary all-glass subcutaneous syringe with a glass plunger. The needle was also of glass made after the manner recommended by Gerota.[4] A fine capillary glass tube was drawn out to a point over a Bunsen flame, and the needle thus made was fitted to the syringe with the help of a piece of thin kid-glove leather wound tightly around the base of the needle.

The success of the injection depends a great deal on the condition of the larynx; the fresher the specimen after death, the better can the vessels be injected. The first specimens which I attempted to inject were too old and dry for the purpose. In these the injection mass did not find the lymphatic channels, but became indefinitely diffused in the subcutaneous tissue. In experimenting with the technic I used the larynges of freshly killed dogs and found that the injection was much easier than in any of the human subjects which I was able to get.

As I have stated before, the limit of the present investigation

was the course of the lymphatic circulation within the larynx to the efferent trunks. The course without the larynx to the glands has already been fully demonstrated in the works referred to.

The freshly removed larynx was split in the median line either anteriorly or posteriorly and laid open by nailing the cut edges to a board, as recommended by Poirier.[5] When mercury was used for the injection the cut edges were cauterized to prevent its escape.

Injection I. Larynx of newly born child, split in posterior median line. Injection mass, mercury. Needle entered in upper part of posterior surface of epiglottis a little to the right of the median line. The mercury quickly filled the network of the epiglottis on both surfaces and at the sides. From the epiglottis it extended onto the ventricular bands on both sides, into the ventricles, and on the right side traced the delicate network of the superior surface of the vocal cord. At the edge of the cord the injection ceased to advance. Practically the whole network of the supracordal division of both sides was thus injected. The superior collecting vessels on the right side were injected but not those on the left.

Injection II. Larynx of child, 6 years. Injection with Prussian blue solution. Larynx split in anterior median line. Needle entered into mucous membrane of upper surface in left vocal cord in horizontal direction backward. Injection made an indefinite blur at the region of entrance. No network shown on cord, but vessels of left ventricle and false cord, left arytenoid, and left aryepiglottic fold well injected. Some of the injection passed across the left arytenoid to the surface of the right arytenoid. The only efferent vessels injected were the superior collecting trunks of the left side.

Injection III. Larynx of woman, about 35 years. Injection with Prussian blue. Larynx split in anterior median line. Needle entered into mucous membrane below right vocal cord, direction backward and slightly upward. The injection passed through the network of the right side over to the left of the median line. It ascended a short distance above the level of the cords at the interarytenoid region. It nowhere passed over the edge of the vocal cord upward. Three efferent trunks in the posterior cricotracheal membrane on the right were injected. The injection also

passed downward in the network extending below the first ring of the trachea on the right side.

Injection IV. Larynx of a child, 2 years. Injection with Prussian blue. Larynx split in posterior median line. Needle entered below left vocal cord horizontally forward. Injection spread over the right subcordal surface and crossed the median line a short distance anteriorly. The small anterior collecting trunk passing out of the cricothyroid membrane was injected. A few posterior trunks passing out of the cricotracheal membrane on the left side were also injected.

This completes the list of injections which were satisfactorily made in human subjects. Injections in many other specimens of larynges failed to show the vessels definitely on account of imperfect technic.

The results may be summarized as follows:

(1) The lymphatic network is continuous throughout the larynx, but at the edges of the vocal cords the network is so fine as to prevent injected masses from passing from above downward or vice versa at this level, excepting at the posterior region of the larynx.

(2) In the supracordal portion the drainage is entirely through the superior collecting trunks which pass through the thyrohyoid membrane.

(3) The drainage from the upper surface of the vocal cord is through the superior collecting trunks on the corresponding side.

(4) In the infracordal region there is slight drainage anteriorly through the cricothyroid membrane, but the main current is through the posterior group of efferent vessels which pass through the cricotracheal membrane.

(5) While the vessels of one side of the larynx may be injected from the other side, the injection is confined to the radicles of the side opposite to the one injected and does not enter the collecting trunks of that side.

These results cannot be claimed to present anything new in our knowledge of the lymphatics. They are of value simply as corroborative of the work of Most and Cuneo in the same direction.

Bibliography.

1. Anat. Anzeiger, 1899, p. 387. Zeitschrift f. Chirurg., Bd. LVII.
2. Gazette des Hôpiteaux, No. 141, 1902.
3. Paris Thesis, 1902.
4. Gerota. Anat. Anzeiger, XII, 8, 1906.
5. Progres Médicale, 1887, No. 19, p. 373.

SCLEROMA OF THE LARYNX.

BY EMIL MAYER, M.D.

IT is always of interest to record the phenomenon of an unusual affection, and the study of the one in question becomes more so when we recall that, like all diseases due to a bacillus, there is the contagious nature of the disease to be considered, together with the possible need for recommending such action as will tend to prevent its spread.

We are all familiar with the interesting cases of this affection in the nose, several of them having been recorded in our literature, but this is the first instance of the affection beginning *de novo* in the larynx to be presented and published in North America.

Like all cases seen in this country, this one also had its origin in that part of Europe occupied by the Slavic race, in the northwest part of the old kingdom of Poland, which belongs in part to Russia, to Austria, and to Prussia.

February 7, 1906, Annie W. presented herself at my clinic, in the Throat and Ear Department of Mt. Sinai Hospital Dispensary, complaining of hoarseness and dyspnea. The patient is a well-developed healthy-looking young woman, gives her age as 16, although from her height and weight she appears several years older.

She was born in Russian Poland in the Province of Wilna. She states that she never had any previous illness and was entirely well until three years ago, when, while aboard ship on her way to America, she caught cold and became hoarse; since that time the hoarseness has remained constantly. She has had masses of crusts and much secretion from her nose and nasopharynx, and within the past few months there has been increasing dyspnea. The inspiratory effort has become more and more labored.

There was at no time pain, fever, or loss of flesh. She has been able to continue with her arduous duties as general house servant. There is not now nor has there been any fetid odor.

Her parents are both living and she has brothers and sisters, all of whom are well. She can recall no one with whom she came in contact who had any similar condition or nasal disease.

Examination of the nose reveals quantities of secretion with crust formation, which, when removed, leave a raw surface in places, but there are no hypertrophic spots anywhere.

The nasopharynx and pharynx are absolutely normal in appearance.

Larynx.—In the anterior commissure there is the same crust formation, which is readily removed. There is a subglottic mass below the right cord, protruding into the larynx, diminishing its lumen by about one-half and having a grayish appearance. The diagnosis of chronic catarrhal rhinitis and nasopharyngitis and laryngitis was made, with a subglottic growth.

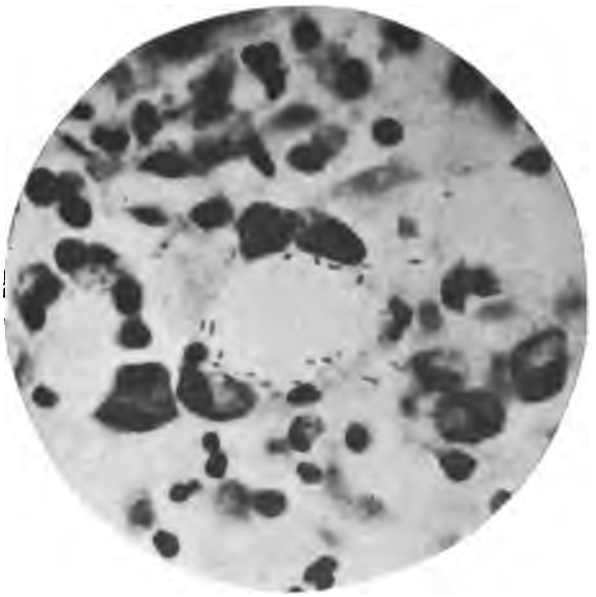


Fig. 1. Mikulicz body with bacilli.

It was determined to cleanse the parts thoroughly and to remove the growth endolaryngeally. Accordingly portions of the mass were removed with the laryngeal forceps. They were small masses of pale tissue, translucent to a degree, resembling soft adenoid tissue. These were submitted, with the diagnosis of subglottic growth, to the Pathological Department of Mt. Sinai Hospital.

I am indebted to the Chief of that Department, Dr. F. S. Mandlebaum, for the report which follows:

"Report on specimen marked subglottic growth, referred by Dr. Emil Mayer:

"The specimen received for examination consists of several small pieces of a rather soft, grayish-white tissue covered with mucosa. After fixation in various solutions, and hardening, they were embedded both in celloidin and in paraffin. The sections were stained by the usual methods as well as by various special stains. When viewed with the low power, the sections convey the impression of a rather uniform cellular structure, not unlike that presented by ordinary granulation tissue, covered with apparently normal epithelium.

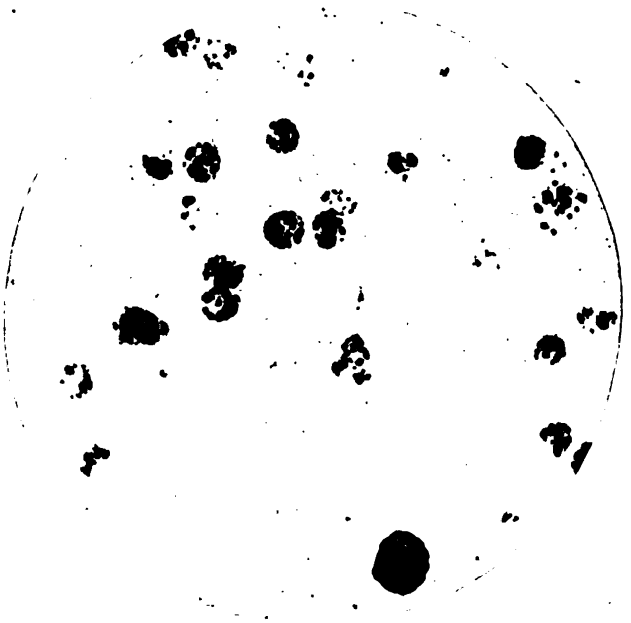


Fig. 2. Hyaline bodies.

"With a higher power, several varieties of cells are seen. Granulation cells with small round nuclei are present in large numbers, also larger cells with an abundance of protoplasm. Besides these, plasma cells are found near the blood vessels, and two varieties of larger cells to be described below. A delicate stroma of connective tisue is found throughout the sections. The blood vessels are numerous and show, almost without exception, a marked proliferation of the adventitia. A few leucocytes are present in the neighborhood of the vessels, and the capillaries show a slight proliferation of endothelial cells.

"The distinguishing feature of the sections, however, is the

presence of two varieties of cells mentioned above. The first type to be described is a huge cell with a homogeneous protoplasm which stains poorly or not at all. Its nucleus, when present, is always situated at the border of the cell. The general appearance is that of an enormous fat droplet. A very few of these cells show nothing further, but for the most part they contain bacilli. These are grouped almost without exception at the periphery of the cell body and the central part is quite free. A few of these cells are seen, however, entirely filled with bacilli. With the oil immersion lens the bacilli are rather short and plump and their ends are rounded. Some appear almost like cocci. With some stains a faint indication of a capsule is seen. The bacilli are easily stained with the usual basic aniline dyes and also take the hematoxylin stain readily.

"The cells just mentioned are those first described by Mikulicz as diagnostic of rhinoscleroma. They are found in great abundance in all the sections, but seem to have no relationship with any definite structure. A few bacilli are seen lying free between the cells, but almost without exception they are present only in the cells just described.

"The second type of cell is also one of large size. This is the hyaline cell, which some authors consider to bear some relationship to the Mikulicz cell. Several varieties of these hyaline bodies are present, showing various stages of the formation of the hyaline substance. The form most commonly seen consists of many spherical granules, quite round in shape and usually of uniform size. These fill the cell completely, and the nucleus is often seen in the exact center of the cell, giving the appearance of a rosette. Other types show the nucleus pushed to the side, while here and there simple masses of hyaline material of a perfectly spherical form are seen lying free between the cells. With hematoxylin the hyaline bodies are tinged faintly blue, while eosin stains them intensely red. In none of the hyaline cells could any bacilli be seen. In sections stained with Unna's polychrome methylene blue, followed by aniline alum, the hyaline bodies are colored greenish blue. With Gram's method many peculiar variations are noted. Some show a flattening of the hyaline granules from pressure in the cell body, others show that certain granules stain more deeply than those immediately adjacent, while others hardly stain at all. With Gram's method the hyaline bodies can be studied with greater ease than with any other stains employed. Although many observers disagree as to the reaction of the bacilli in cultures to Gram's stain, I find that in sections, if the discolorization is not carried too far, the bacilli hold the color when treated with this staining method.

"Regarding the number of hyaline cells present, as many as 80 to 100 could be counted in one field with a medium-power objective." (In order to obtain, if possible, the bacilli in pure culture,

further portions were asked for and these were removed with the customary bacteriologic precautions, and from the freshly cut sterilized surfaces the bacteriological examinations were made.)

"These examinations were conducted by Dr. H. L. Celler, who reports pure cultures of a mucoid, Gram negative, capsulated bacillus, belonging to the Friedlander group. With the facts in hand, viz.: the presence of hyaline bodies and Mikulicz cells, together with the bacilli obtained by culture, the diagnosis of scleroma (rhinoscleroma) is fully established."

With the diagnosis presented by the pathologist, I must admit

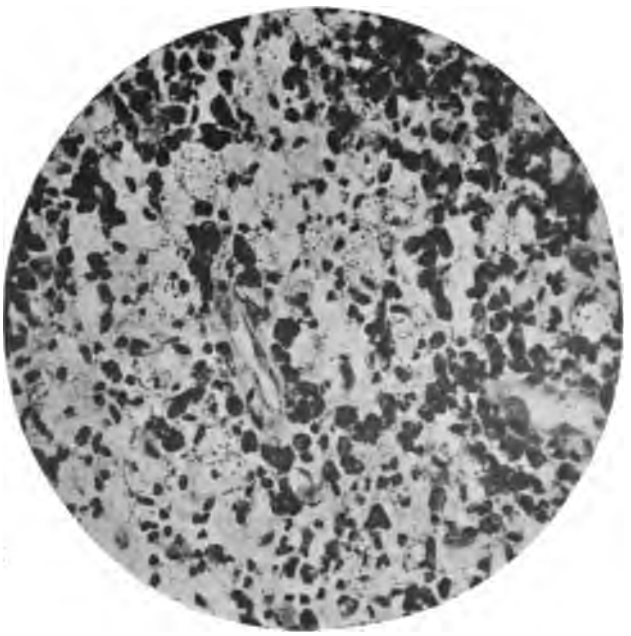


Fig. 3. Mikulicz cells containing rhinoscleroma bacilli.

that I was wholy surprised, and the impression is made that many other cases would be so diagnosed, if carefully sought.

The patient's condition, both as to hoarseness and dyspnea, improved perceptibly from the first removal, bleeding was slight and no reaction occurred.

Her condition at a recent examination three months after the removal of the growth was of absolute freedom from dyspnea and hoarseness; the copious catarrhal condition has greatly diminished, though persistent, and there is a small grayish exudate still below the right cord.

A study of the literature of scleroma of the larynx must include those under the heading of rhinoscleroma.

How vast the subject is may readily be seen when Juffinger[1] has a list of 180 references to the general subject.

The writer is fully in accord with the proposal to use the term scleroma, adding thereto the name of the part affected.

Since the publication of Pieniazek's article on rhinoscleromas,[2] a number of reports of cases of scleroma of the larynx have been recorded, and to insure a fuller study of the subject they are here briefly stated, reference being made only to those of undoubted authenticity and where the larynx was involved either alone or at first.

Our own literature on this subject is scant.

Shurly[3] mentions Cornil and Alvarez to have recorded a case of scleroma confined to the larynx.

Goodale[4] makes brief histological mention of rhinoscleroma.

Ingals[5] says there is no proof of its contagiousness, while D. B. Kyle[6] mentions the variety beginning in the nose, extending to the pharynx and larynx, but does not speak of the affection originating in the larynx.

In several instances members of the same family have had the same affection.

Robertson[7] reports two sisters with scleroma.

Secretan[8] two brothers.

Baurowicz[9] two sisters and two brothers.

Streit[10] two sisters.

Gerber[11] two sisters. (These may be the ones mentioned by Streit.)

These would certainly indicate proof of contagion.

While the diseased condition is usually found beneath both cords, it is, as in my own case, occasionally one-sided.

Thus, Juffinger[12] in his excellent monograph on thirty-eight cases of scleroma says that he has been unable to find the record of any one-sided case of laryngeal scleroma; he has seen such a case, where nothing was found in the nose and nasopharynx, but on removal of portions of the subglottic infiltration the diagnosis was established both by culture and by the microscope.

P. Pieniazek[13] describes this condition, and adds that Stoerck's blennorrhea must be considered as scleroma, as also the cases described as chorditis vocalis inferior.

He used to differentiate between the diagnosis of scleroma and hyperplasia of the mucous membrane, but, as the recurrences of the latter inevitably followed, he reached the conclusion that they were all scleroma.

The diseased state he found most often in the region of the glottis, particularly below the rima glottidis, in and over it in the vestibule, and rarely in the trachea and bronchi. There may be diffuse infiltrations, large or small nodules, forming a granulomatous mass, protruding or lying flat on the surface of the mucous membrane. The largest tumefaction appears on the posterior tracheal wall. The small growths are soft and consist mainly of the Mikulicz cells.

In time the number of round cells and connective tissue increases and the growths become firmer. Solitary nodes grow more slowly, contain more connective-tissue fibers, and the growths become very hard. They may, however, be qûite soft and yielding.

As to the manner of onset: The prodromal catarrh begins in the nose and may persist for years before it reaches the larynx, and it may exist for years in the larynx before the formation of a scleromatous infiltrate appears. It is apt to be a long time before it spreads further and hence it is rare for the bronchi or trachea to be affected early.

It may last dozens of years, and often remains limited to a single spot, and it may be associated with pharyngeal scleroma and rhinoscleroma.

There are cases in which beyond the prodromal catarrh there are no other symptoms.

E. Bunzl-Federn[14] reports a case of scleroma of the upper air passages.

Male, age 19, Bohemia, three years ago began to be short of breath when walking rapidly; crust formations in the nose and throat followed. Six months ago the dyspnea became so great at night that he believed himself to be choking. He would then cough up hardened secretion and breathe freer. Patient was pale, anxious; there were stridor, dyspnea, and loss of voice. Dark green crusts filled larynx and nose, which when removed relieved dyspnea. Cords red and apparently broader than normal.

Right cord has in the vicinity of processus vocalis a semicircular thickening about size of half a pea, a smaller one on the left side. Below the right there is a red tumefaction narrowing the lumen, and still lower on the line of the cricoid there is another tumefaction.

Nose. On the right inferior turbinate a smooth tumor and two small ones on the middle turbinate; none in the left; several in posterior nares.

Patient lived in Russia until 14 years of age. Diagnosis proved microscopically and bacteriologically. There is much to show that it began in the larynx.

Baumgarten:[15]

Female, age 20. Hoarse constantly for three years with increasing dyspnea. For a year she had been unable to make any sound and of late her breathing had become much impaired and labored. For the last few weeks she has had two or three suffocative attacks daily, becoming cyanotic. The ary-epiglottic folds were infiltrated, there was slight mobility, the mucous membranes of the larynx anemic and covered with small white dried blisters, false cords and interarytenoid folds hypertrophied, the true cords hidden mainly. The mucous membrane beneath the cords and that of the posterior wall infiltrated and pushed forward, decidedly narrowing the lumen.

Cultures from the nose and throat resulted in affirmative proof of the diagnosis.

He has seen several primary cases in the larynx, but there were here and there nodules, while this patient had but the one in the nose and this latter he believes to be of recent origin.

P. H. Gerber[16] ("Scleroma, Particularly in East Prussia") says that there is no doubt that the original nomenclature should be changed from rhinoscleroma to scleroma, especially if we accept subglottic cases of blenorrhea (Stoerck) as of this variety. Without the microscopical examination it would not have occurred to him to place the cases of chorditis vocalis inferior and similar ones among the scleroma cases. He records ten cases of scleroma.

In the nine subsequent cases there were no manifestations of changes in the external nose, neither at the time nor for years subsequent.

The nasal interior in two cases showed normal conditions, in three ozena, and in one the usual hyperplastic rhinitis; in three typical scleroma.

In the posterior nares the septum was more or less thickened and the passages narowed; in one case the pharyngeal tonsils were hypertrophied. In none of the cases were there any typical changes in the pharynx, in two there were hypertrophied tonsils and granular pharyngitis. In the larynx in three cases the ste-

nosis was superglottic, in the other six there was the usual subglottic swelling, partly with and partly without ozena of the trachea.

The microscopic examination was not made in three cases, in one the result was negative, in two bacteriological only, while in three it was shown positive both histological and bacteriological.

Four cases came from Russian Poland and five from East Prussia; none of the latter had ever been in Russia.

In the first series of 87 cases described by Wolkowitsch there were but 4 with normal external nose, while in 38 cases of Juffinger there were 34 with normal noses, and the latter cases make the impression of milder infection. This cannot be attributed to early or late appearances, as he has had an opportunity of watching the cases from five to eight years. This was due to a lesser virulence of the virus in all probability, also to the different geographical distribution.

The writer is confident that the disease was conveyed from Russia. Although its contagiousness is not proven, yet it has much in common with leprosy.

Gerber believes that the cases of Wolkowitsch, Juffinger, and his own show varying degrees of the infectious process, at each stage a diminution of the virus, due perhaps to geographical conditions commensurate with the increasing distance from the focus of the disease.

Alex. Baurowicz,[17] Cracow, in a study of one hundred cases of scleroma says that the changes are most frequently found in the subchordal space, then in the vicinity of the base of epiglottis, and finally at the laryngeal entrance, but always on the inner surface of the larynx. The posterior wall of the larynx is rarely affected.

Beginning anteriorly as a subchordal infiltration, it slowly descends to beneath the processus vocalis. This is rarely reversed. The tumefaction is at first a pale red color, then white, of smooth surface, connected either with the under surface of the cords, or separated by grooves of greater or lesser depths. They are rarely one sided, and the size of the lumen depends on their growth. The voice is usually affected. With the bacteriologic or histobacteriologic examination we are enabled to have a firm foundation for diagnosis and to differentiate it from lupus.

In the early stages of the subchordal thickening there is a simi-

larity to submucous inflammation or a perichondritis of the cricoids, as also a luetic or tubercular infiltrate or new growth of any sort, and in primary conditions we must exclude these in the differential diagnosis.

The length of time of change, slow development, absence of pain, and drying of secretion will also aid in differentiating.

In six of his cases it occurred primarily in the larynx.

Thaddeus Majewski[18] ("A Case of Scleroma of the Air Passage").

Female, 19, had subchordal infiltration at age of 8; at age of 16, right false cord became thickened and vocal cord protruding; motility nearly lost, arytenoid mobile, left vocal cord normal. Below both cords a membrane and subglottic infiltrate; under left vocal cord a continuation of the membrane. Bacteriologic and microscopic examination confirmatory. Tuberculosis followed and patient died. The autopsy substantiated the diagnosis and is complete.

H. von Schroetter[19] ("A Further Contribution to the Knowledge of Scleroma") reports a few more cases of scleroma which may be of value in adding to our knowledge on the course, pathogenesis, and the extension of the disease. In two cases the tongue was retracted so much that a high degree of stenosis of the faucial isthmus was occasioned; in one of these the condition after lasting twenty years seemed to remain in statu quo. Another case would indicate that the infection of the bacillus may remain latent more than ten years. Another case would show that these laryngeal diaphragms differ materially from the ordinary thin membranous diaphragms.

In scleroma there is a wrinkled product indicating its origin. Papillomata of the mucous membrane were frequently noted. The affection occurs in brothers and sisters, and in one instance in parent and children. He had not been able to produce infection on animals or human beings, and infected himself without result.

Barth[20] records a new case of scleroma in East Prussia.

Male, age 45, never lived in a scleroma territory. Although patient claims that his nose trouble began with a bite of a horse, this cannot be substantiated, as there is no evidence thereof, not even external injury. The posterior nares and larynx are so affected as to cause much dyspnea and great distress. This seems to be a case originating outside of the scleroma district.

Belogolow,[21] Russian Medical Society, St. Petersburg, 1902, reports a case of scleroma respiratorium—a young peasant girl of 19, whose nose, pharynx, and larynx were affected. He noted points of tenderness in various parts of the nose and pharynx.

In the discusion that followed, Ichemolossov reports a case of scleroma of the upper lids which he saw in the ophthalomological clinic at Moscow.

Simanovski said that early cultures should be taken of the nasal mucus in agar-agar.

Chepovalenkov asks if, instead of the superior, the process may commence in the inferior air passages.

Simanovski calls attention to von Schroetter's monograph, where several case of primary tracheal infection are recorded. In general it is extremely difficult to make a diagnosis. In most cases it is not recognized.

Von Lenart[22] reported a case of scleroma of the larynx at the meeting of the Hungarian Association of Throat and Nose Physicians, February 27, 1902.

A farmer, age 30, began to cough after a week of dyspnea; tracheotomy performed and tube kept in situ for six weeks, when it was removed; dyspnea returned after several months. Laryngeal examination: left vocal cord hypertrophied; mucous membrane below the cords swollen on each side, thus narrowing the lumen; thick crusts cover these infiltrations, right band moves freely, the left less so, the voice clouded.

In the posterior nares there are two long thick swellings, red in color and smooth, as also two in Rosenmuller's fossa; in the left side of the nose enchondrosis; middle turbinate hypertrophied close to the septum. On the septum there are several flat slightly uneven nodules the size of a pea, also on the floor of the nose; these as well as the laryngeal swelling are of firm consistence. The diagnosis was substantiated histologically.

O. Frankenberger[23] ("Scleroma of the Larynx") reports a case coming from the northeast part of Bohemia in a 53-year old woman. At the autopsy the sternocleido-mastoid muscle and the superficial fascia were enormously hypertrophied and sclerotic. Otherwise the scleromas were found only in the soft palate and in the larynx.

E. Ziffer[24] ("A Case of Laryngeal Sclerosis"). This case, according to the author, belongs to the class of cases described by Stoerck as scleroma of the larynx.

Novotny[25] ("Two Cases of Scleroma").

In the first case the disease was limited to the larynx and trachea, the posterior laryngeal wall being first infiltrated and gradually the deeper parts, eventually causing stenosis.

In the second case the nose, larynx, and trachea were involved and finally the hard palate.

Hermann Streit[26] ("On the Occurrence of Scleroma in Germany"). Of eighteen undoubted cases of scleroma, three had brothers likewise affected, one a sister, and in another the mother is said to have scleroma.

As eighteen cases were found in Germany, Streit believes the affection to be more dangerous than leprosy, especially as the latter is more readily diagnosed. He believes that scleroma should be classed as a disease to be reported to the authorities, that suspicious persons should be sent for examination by competent authority at the cost of the government, and undoubted cases segregated.

Hausel[27] at a meeting of the Vienna Larynological Association, February 4, 1903, reports a case of scleroma of the larynx.

Deutschlander,[28] seventy-sixth meeting of German Naturalists and Physicians, Breslau, 1904, demonstrated three cases of scleroma laryngis.

In the discussion which followed Streit insisted that the diagnosis should in every instance be substantiated by the bacteriological and histological examination. This would give a solid basis to future study of this affection.

Gerber, replying to the former, said that in certain cases it was absolutely impossible to have the very desirable proof histologically. Still if we have to deal with an especially chronic condition remaining in statu quo for a long time, developing slowly afterward, often with only cicatricial tissue or perhaps a single band like a curtain, we hardly expect to find histologic proof. In these instances he would confidently make the diagnosis of scleroma.

Regarding the spread of the disease, while formerly it was limited to Galicia and Poland, it now may be found in the provinces of Silesia and Prussia.

Streit stated that he visited the scleroma territory under governmental direction, and declared his conclusion to be that scleroma must be looked upon as contagious, and he proposes: First, that scleroma should be classed among the diseases requiring reports from the attending physician. Second, the foci should be

under the particular control of the health officers of that district. Third, known cases should be seen at least once a year by the health officer, and be instructed in necessary hygiene. Fourth, every two or three years a special commission, one of whom at least must be a specialist, should visit the foci and make special examinations of the other members of the family. Fifth, those requiring medical care to be sent at the cost of the state to Koenigsberg or Breslau, where a special place shall be reserved for them. Private sanitaria are not available, as the segregation cannot be enforced in accordance with hygiene.

Lissauer[29] reports a case in which the nose, larynx, and pharynx were affected. Although a few cases are recorded of the disease occurring in brother and sister, he does not consider its contagiousness proven.

M. v. Zeissl[30] says that the prognosis is bad in spite of all that may be done.

Von Sokolowski[31] ("A Case of Tumor of the Trachea").

Male, age 32, coughed for eight months, with progressive dyspnea. An induration was found below and in the left vocal cord which narrowed the lumen. The general condition of the patient being so good and no abnormalities in the lungs, the writer believes the case to be one of scleroma of the larynx.

K. v. Schiller, in the report of the proceedings of the Society of Hungarian Laryngologists and Otologists at its meeting of June, 1904, reports two cases of scleroma of the larynx.[32]

First case: Scleroma of the nasal cavities and of the larynx, dyspnea; intubation with O'Dwyer tubes was successful; a febrile reaction ensuing after intubation.

Second case: Patient was intubated years ago without success; tracheotomy followed by intubation was successful, and patient discharged almost well. Recurrence; reintubated without success.

Zienbiecki[33] ("Fatal Hemorrhage After Tracheotomy in a Case of Laryngeal Scleroma"). Hemorrhage occurred on the fiftieth day after tracheotomy from erosion of the arteria anonyma.

Petrini-Galatz[34] ("Rhinoscleroma or Gleoscleroma") reports the case of a young girl, 15, born in Buzen, Roumania, as the first native case of scleroma. Complaints of patient are that it began in the nose, deglutition then became difficult, nasal respiration ceased and headaches ensued. It is possible that the disease began in the uvula.

Schilling[35] ("Diphtheria Bacilli in Rhinoscleroma").

The increasing interest in rhinoscleroma from a sanitary standpoint makes the writer feel justified in presenting still another case in spite of the very full literature. The probable diagnosis is rhinoscleroma.

Nose is the picture of ozena and a penetrating odor. Turbinates greatly atrophied, with adherent crusts which when removed leave a bleeding surface. The surface covered with small red warts. Pharynx dry, glistening, and atrophic.

Rhinoscopically there is a tumor the size of a cherry pit. There are whitish tumefactions of uneven surface narrowing the lumen, but there was no dyspnea. Smears taken at different times showed diphtheria bacilli. The clinical picture of the case has no analogy to that of chronic diphtheria. The portions of the growth from the larynx showed characteristic scleroma conditions, and hence the writer believes that there was an original scleroma with secondary diphtheria.

The diphtheria bacillus is often found in the mouth, and the diseased mucosa might well propagate the bacillus without the symptoms of diphtheria. The lesson to be derived is not to depend entirely on the bacteriological examination; hence removal and examination of portions are essential.

If the Mikulicz cells are found we are compelled in the light of our present knowledge to accept the diagnosis of scleroma.

Diphtheria serum had no effect on diminishing the bacilli here.

This patient does not come from a scleroma country.

He is said to have worked with a Galician who had some nasal disease and he may thus have become infected.

Buschke.[36] The writer does not wish to depend too much on the presence of the bacillus for diagnosis, as its etiologic significance is lately made dubious.

Spontaneous cases of scleroma occurring in remote countries are two in Switzerland, and Wende records a case as occurring *de novo* in the United States. The latter does not seem to have been conclusively proven histobacteriologically.

Regarding its etiology. It occurs oftenest in people who live in filthy surroundings, in huts with the bare earth for the floor, and in close proximity to animals like cows, pigs, dogs, and cats, and yet a fair proportion of those affected belong to the better classes. It is most likely that the former are most readily subject

to a catarrhal affection and that this forms a place for the ready lodgment of the disease. Injuries to parts may add to the susceptibility.

While it affects the nose more frequently than the nasopharynx and larynx, it may affect the mouth, the ear, the lids and cheeks.

It is indubitably proven to originate in the larynx in some cases.

The prognosis as to recovery is bad. The general health may not be impaired save from such symptoms as the varying stenosis occasions.

The disease may progress and suddenly remain in the same condition for years.

Sooner or later there is recurrence.

As to treatment, the external conditions have been much benefited by the use of the Roentgen rays.

For the laryngeal scleroma, removal endolaryngeally has at times benefited the patient, as has the pressure of an O'Dwyer tube both before and after tracheotomy, and the increasing-sized Schroetter tubes have been useful for the time being. Slow dilatation may be of value by means of the writer's hollow introduced for the O'Dwyer tube.

It is safe to assume that there are many more cases than even the large number already recorded.

From a study of this subject we are led to conclude that in scleroma we have a chronic incurable affection, contagious to a certain degree.

As the highest art of medicine lies in prevention and not treatment, it would seem advisable that the sanitary authorities take appropriate action now, while the number of cases are comparatively few and far between.

Whilst not agreeing with the view of Streit as to the relatively greater dangers in scleroma than in leprosy, yet, for the reason given, that it is easier to control the few cases now than the many the future is sure to bring, his views as to sanitary regulations in Germany and the territory adjacent to the infectious district should receive cordial endorsement.

As far as our own country is concerned, every quarantine officer should look upon undoubted cases of rhinoscleroma as infectious and these should not be allowed to land and be deported at once. In addition, every case of long-standing hoarseness, with or with-

out dyspnea, especially when associated with chronic catarrhal conditions, should be detained such time until some competent expert authority would determine the presence or absence of the disease.

References.

1. Juffinger. Handbuch der Hautkrankheiten, Wien, 1904, Bd. 3, p. 567.
2. Pieniazek. Handbuch der Laryngologie, etc., Heyman, 1898, pp. 1304-1328.
3. Shurly. Diseases of the Nose and Throat, p. 333.
4. Goodale. (Posey and Wright) Diseases of the Eye, Ear, etc., p. 705.
5. Ingals. (Burnett, Ingals, Newcomb) Diseases of the Eye, Ear, etc., p. 283.
6. Kyle, D. Braden. Diseases of the Nose and Throat, p. 150.
7. Robertson. Internat. Centralbl. f. Laryngologie, Bd. viii, 70.
8. Secretan. Ann. del Mal. d'oreille du Nez, etc., 1894, vol. xx, p. 675.
9. Baurowicz. Arch. f. Laryngologie und Rhinol., 1900, Bd. x, p. 363.
10. Streit. Arch. f. Laryngol. und Rhinol., 1903, Bd. xiv, p. 257.
11. Gerber. Berliner klin. Wochenschr., 1903, xx, 21, p. 491.
12. Juffinger. Das Sklerom der Schleimhaut der Nase, des Rachens, des Kehlkopfes und der Luft-roehre, Wien, 1892.
13. P. Pieniazek. Loc. cit.
14. E. Bunzl-Federn. Prag. med. Wochenschr., March 30, 1899.
15. Baumgarten. Report of the meeting of Hungarian Ear and Throat Physicians, Oct., 1898. Internat. Centralbl. f. Lar., 1899, vol. xx, p. 477.
16. P. H. Gerber. Arch. f. Laryngol. und Rhinol., 1900, Bd. x, p. 347.
17. A. Baurowicz. Loc. cit.
18. Thaddeus Majewski. Monatsschr. f. Ohrenh., July, 1900, vol. xxiv, No. 7, p. 250.
19. H. von. Schroetter. Verhandl. der Deutschen Pathol. Gesellschaft zu Kassel, Sept., 1905, p. 215.
20. Barth. Arch. f. Laryngol. und Rhinol., 1903, xiv, p. 573.
21. Belogolow. Rev. Hebdom. de Laryngol., 1903.
22. v. Lenart. Internat. Centralbl. f. Laryngol., 1903, p. 205.
23. O. Frankenberger. Wiener klin. Rundschau, 1902, vol. 17, Nos. 21 and 22, pp. 435 and 451.

24. E. Ziffer. Wiener med. Wochenschr., 1902, vol. lii, Nos. 26 and 27, pp. 252 and 314.
25. Novotny. Prseglad. Lekarski, 1903, No. 9.
26. H. Streit. Loc. cit.
27. Hausel. Internat. Centralbl. f. Laryngol., 1904, vol. xx, p. 153.
28. Deutschlander. Idem, vol. xx, p. 616.
29. Lissauer. Allg. Med. Central-Zeitung, Berlin, lxxii, p. 111.
30. M. von Zeissl. Deutsches Klinik, 1905, vol. x, p. 440.
31. von Sokolowski. Internat. Centralbl. f. Laryngol., 1905, vol. xxi, p. 128.
32. K. von Schiller. Internat. Centralbl. f. Laryngol., 1905, p. 185.
33. Zienbiecki. Internat. Centralbl. f. Laryngol., 1905, p. 265.
34. Petrini-Galatz. Med. Orient., Paris, 1904, viii, p. 219.
35. Schilling. Arch. f. Laryngol. und Rhin., 1905, Bd. xvii, p. 209.
36. Buschke. Berl. klin. Wochenschr., 1905, xiii, p. 270.

Discussion.

DR. H. L. SWAIN.—I would like to inquire of Dr. Mayer who the writers are who classify chorditis vocalis inferior with scleroma.

DR. MAYER.—Several authors, Gerber in particular.

DR. SWAIN.—I remember I was recently commenting in my own thought upon the fact that in all the years since I have been at work here in America I have never seen but one case of chorditis vocalis inferior, but in the clinics over in Germany we always had them. I remember in Leipsig there were three cases who came regularly and often, being used as living phantoms for us in the clinic, and it is a very interesting point to learn that they are being now classed as scleroma.

DR. MAYER.—Just a word, Mr. Chairman, and that is for some time since the appearance of Heymann's Handbuch there are quite a number who have paid some attention to it, and they have found the scleroma bacillus in these very cases of chorditis vocalis inferior. It is rather remarkable that we do not see these conditions here with us, and I recall with great surprise finding that Luning at one time recorded one hundred odd cases of chorditis vocalis inferior, the principal cause being typhus fever, which does not exist in this country. That perhaps is one of the reasons we do not see more of it.

(*Candidate's Thesis.*)

WHAT IS THE PRESENT STATUS OF THE OPERATIVE TREATMENT OF DEVIATION OF THE NASAL SEPTUM? A CRITICAL REVIEW BASED UPON LITERATURE, AND ESPECIALLY A PERSONAL EXPERIENCE OF 127 CASES OPERATED UPON BY VARIOUS METHODS.

BY JOHN R. WINSLOW, M.D.

It is with considerable hesitation that I presume to present to this Association, numbering among its members many of the makers of rhinology, in the volumes of whose Transactions its history is recorded, so timeworn a theme.

I must confess, however, that for some time I myself have felt uncertain and perplexed as to where we stand in the treatment of septal deviations; others, too, must have felt the same doubt, for I learn that this is to be a subject for discussion at the coming meeting of the British Medical Association at Toronto.

The era of the Asch operation, as the only or even the principal one, has passed, and the submucous operation is now dominant; this is attended with all the enthusiasm and eclat of a new procedure, and for the time being has overshadowed all others.

Have we at last reached the much desired goal, and found in this a panacea for all varieties of septal deformity? Many so think. Are the older classical operations to be cast aside as superannuated and useless? Lack of sufficient experience and an inadequate number of recorded cases were formerly the reproach cast upon these methods; surely enough cases are now upon record by each of them to enable us to determine their exact value and definite indications.

There is no single method suitable for every variety of deformity, but all of them give good results in certain cases. It seems to me that the indications for the selection of each particular operation in definite types of deformity have not been suf-

ficiently defined. The lack of detail in recorded cases would seem to indicate insufficient preliminary study. That the older methods have not met every requirement and have not proven entirely satisfactory is evident from the many operations and the constant striving after new ones. I believe we might profitably endeavor to ascertain at this time the causes of failure and the directions in which improvement is to be desired and is attainable.

Have increased skill and improved technic, gained by experience, added anything to their availability? Would a more careful study of the various deformities and a better selection and adaptation of operative measures yield commensurate improvement in results? These and allied questions have for some time been presenting themselves to the writer's mind.

Wishing to ascertain their personal opinion as to the ultimate value of their methods, I made inquiry of the originators or chief exponents of the principal standard operations upon this point. From the replies received, it developed as a significant fact that these authorities still claim satisfactory results from their personal work, which have increased progressively with increased skill and experience; and that they are by no means willing to concede the supplanting of their methods by the submucous, although one at least frankly admitted that the scope of his has been considerably limited thereby.

It also developed that in some instances the current description of the operation is inaccurate and out of date.

Some causes of defect or failure in results may be found in the following considerations:

1. The operation is being performed more and more frequently by the general practitioner and the general surgeon. Aside from exceptionally easy cases, I do not believe that either of these can obtain successful results. No one is more ready than I to acknowledge and admire the brilliant achievements of the American surgeon, but I maintain that we make a grave mistake in leading the general practitioner, whether physician or surgeon, to believe that deviations of the nasal septum can be easily and successfully corrected by him. Some of the worst bungles that I have ever seen, have been the result of such operations at the hands of general surgeons of renown. If there be any excuse for specialism in nose and throat work, it is surely in the line of septal orthopedics. To successfully treat these cases one must

possess a special mechanical ingenuity and dexterity in endonasal technic, both in operating and in aftertreatment, that can only be acquired by constant practice. It is a specialty within a specialty; one must not only be a specialist, but an expert in this particular line of work. Not every dentist is a skilled crown and bridge worker, nor does every nose and throat specialist obtain the best results from his septal operations.

2. Textbook descriptions are of necessity meager, unsatisfactory, and even at times inaccurate; the very details that make for success are often wanting. Hence it is extremely important to consult original sources in order to familiarize ourselves with the minutiæ of each method. Even then, much misunderstanding results from only reading descriptions. It is therefore of great advantage to see each operation performed by its originator, or some one equally skilled in its use.

Another source of error is found in failure to follow up improvements in the various methods. This is a line of work in which ideas and practices are even yet not fixed, and improvements are constantly resulting from increased experience; hence it is necessary to keep constantly abreast of the advances that are being made.

3. Lack of detailed preliminary study of each individual deformity as a distinct entity, and failure to adapt to the particular variety of deformity that operation best suited to it, are an important and frequent causative factor. An exact knowledge of the anatomical and clinical peculiarities of the different forms of deformities is absolutely essential to enable us to select the right method and perform the same properly. Careful preliminary inspection under cocaine is essential to accurate diagnosis, but inspection alone often yields erroneous impressions. The graduated probe is often requisite to determine the distance and extent of the deformity, the consistence of projections (tubercle of septum, etc.) and the depth of the concavity in angular deformities; at times the fingertip may profitably replace the probe; the septometer is sometimes necessary to determine the thickness of the septum.

4. The excessive use of general anesthesia and consequent inexact application of the method used is another source of faulty results. A single incision precisely applied in the right location will accomplish more than multiple incisions or general crushing

applied at random, and will avoid the risk of sloughing of the septum and of sepsis. It is then of the utmost benefit, whenever possible, to operate under visual inspection and cocaine anesthesia, using adaptable instruments allowing the accurate application of incisions in whatever location they will be the most effective.

Indications.—While some degree of septal deviation is so common that it may almost be regarded as a normal condition, a deviation becomes pathological only when it interferes with normal nasal function, producing consequences that can rationally be attributed to the deformity; according to Beaman Douglass, this occurs in from 11 to 12 per cent. of cases only. Some of the most marked deformities that I have ever seen caused no detectable disturbance. We should operate therefore only for the relief of definite symptoms, and not simply because of anatomic abnormality.

The object of operation is the restoration of the nasal functions, not only the respiratory, but the aural, the vocal, and the drainage functions as well. Unusual subsidiary indications may consist in the relief of pressure neuroses and as a means of diagnosis and treatment in affections of the superior regions of the nose (attic). The test of success is not absolute symmetry, but the restoration of the defective nasal functions to normal.

Classification.—From an operative standpoint it is essential for us to know the following details as to the deformity:

1. Location; whether anterior, posterior, superior, or inferior, which determines the accessibility, i. e., ease of operation.

2. Composition; i. e., the parts which take part in it; whether quadrangular cartilage, nasal spine, vomer, lamina perpendicularis, etc., determining the kind of instruments available, whether knife, saw, chisel, or cutting forceps.

3. Thickness (interstitial); also governing the selection of instruments and method.

4. Shape; whether having a plane or ridged surface, with or without an overhang. Also whether of a simple or complex form, determining the selection of method.

In my experience the possible sites of deflection in the order of their frequency are:

1. Dislocation of the lower border ("pyramidal cartilage").

2. Deviation or dislocation of the chondro-vomeral articulation (angular).

3. Incurvation of the face of the quadrangular cartilage itself (bowed, angular, and sigmoid).

4. Deviation or luxation at chondroethmoidal articulation (vertical angular).

5. Deviation at chondro-vomero-ethmoidal articulation (ascending angular).

6. Incurvation of the face of the perpendicular plate of the ethmoid (bowed or angular), usually associated with deformity of the cartilaginous septum (sigmoid).

Shape.—There is an innumerable variety of septal deformities, which may be classed as simple and complex.

A simple deformity presents an incurvation to one side only, having a regular, smooth surface.

A complex deformity consists of a combination of deflections and a variety of shapes, which may be so irregular as to defy description, or it may be associated with various complications, either septal (dislocation, synechia, thickening) or extraneous (turbinal, polypi, adenoids).

Case Analysis.—All cases utilized in this analysis were carefully selected upon rigid indications and personally performed; hence their relatively small number. None of my cases performed prior to the Asch era is included. The operations were performed at the Presbyterian Eye, Ear, and Throat Hospital (105), the University Hospital (15), or at my private office (7), during the period from February, 1892, to May 1, 1906.

The cases are distributed as follows: Asch principle, 45 cases; Douglass principle, 37 cases; Gleason operation, 23 cases; Supralabial operation (alone), 2 cases; Submucous operation, 15 cases; Varia (Bosworth, Krieg, Roe, Moure), 5 cases—127 in all.

Anesthesia: General, 60 per cent.; cocaine, 30 per cent.; combined, 10 per cent. Analysis of recent cases only practically reverses this percentage.

Perforations: 5 per cent (Asch. 4; submucous, 3).

Hemorrhage: Two cases of secondary, having no relation to the type of operation.

Results: See special operations, bearing in mind that the Asch had to bear the brunt of inexperience and lack of skill.

Analysis of my personal cases shows 40 per cent. cartilaginous and 60 per cent. mixed (bony, 10 per cent). Also the usual

excess of males (70 per cent.), to my mind an argument in favor of traumatic origin.

All these deformities occur with and without thickening; thickening may be superficial (crests and ledges) or interstitial (fibrosis). The term "redundant" should be reserved for excess of septum en masse with relation to the vertical and horizontal measurements of the nasal chamber, and should not be applied to superficial or interstitial thickening.

Bowed deviation is usually located at the center of the cartilaginous plate, but may be low down near the nasal floor; it may extend back into the bony septum, but my experience does not substantiate Freer's statement that this is the general rule.

Angular deformities exceed the bowed in my experience (70 per cent. "mixed" cases). Angular deflection is oftenest located in the body of the quadrangular cartilage (slight or "ridged"—moderate-extreme), or it may be located at the articulations of the cartilage with the vomer and the ethmoid, associated with deflected osseous edge or dislocation of the articular surfaces; the probe must be employed to determine its true nature in such cases.

I have found no constant relation between shape of deformity and existence or non-existence of traumatism, and believe that most deformities are traumatic, their shape depending upon the amount of force exhibited. Among the one hundred and twenty-seven cases were five of separation of septal plates, not including so-called pyramidal dislocation.

The commonest bony deformity was deviation at the chondro-osseous articulations, then bowed deviation of the perpendicular plate of the ethmoid.

The most usual compound mixed deformity was bowed ethmoidal, associated with angular cartilaginous deviation, which is of traumatic origin, these being the areas most easily fractured.

Then mixed sigmoid deformity, vertical or horizontal. Personally, I have never seen a double angular or zigzag deflection.

The nostril is only as wide as its narrowest portion; a linear vertical deviation (pyramidal cartilage anteriorly; osseocartilaginous junction posteriorly; hypertrophied "tubercle") may as completely block the passage of air as an extensive deformity.

The treatment of septal deviation is exclusively surgical. A discriminating and impartial observer, however, must admit that the operation is often unnecessarily performed when the same results could be secured from simpler, safer, and surer methods.

Conservatism and judgment in the selection of cases for the operation are indispensable. We have not yet attained that degree of certainty in results by any method which warrants us in regarding this as a minor operation to be performed in doubtful cases, or for the relief of trifling symptoms. "The magnitude of operation must not exceed the importance of symptoms" (Semon). If they are properly selected, I cannot understand from whence the hundreds of cases, now being reported annually, come.

The best treatment of deviated septum may consist in avoiding the operation. The septum was formerly the noli me tangere of rhinology; it would seem that we have now swung to the opposite extreme. The suggestion of John Mackenzie to remove portions of the inferior or the middle turbinal as a substitute for operation on the deflected septum in certain cases when the patient's poor physique or the magnitude of the operation renders it wise to let the septum alone is too sensible to be allowed to become obsolete.

The first step in all cases of deflection is to reduce complex to simple forms, and to remove all complications.

An overwhelming argument in favor of the invariable primary removal of all marked spurs or ledges is that this alone often proves sufficient to relieve the symptoms, and the major operation is thereby avoided. This may be facilitated in doubtful cases by preliminary submucous infiltration of the concave side (Escat).

But frequently the removal of thickening alone is not sufficient to establish free respiration upon the narrower side, and the deviation must also be corrected.

The shock of septal operation may be considerable and preliminary tonic treatment of the patient and of the nasal mucous membrane is desirable.

The method selected should be the simplest available in the particular case, and should be adapted to the patient with respect to age, temperament, and physical condition; it should also be

adapted to the character of the deformity, as to its location, composition, shape, and thickness.

The indications in the correction of these deformities are:

1. To overcome the resiliency of the cartilage.
2. To provide for "redundancy."
3. To replace the septum in its normal position.
4. To retain it in this position until it becomes fixed.

All methods that fulfil these requirements will be successful. The wonderful resiliency of the cartilage has proven the stumbling block. To overcome this various methods have been employed:

1. Comminution or fracture with forceps (Adams, Roe, Kyle).
2. Incisions of varying number and direction (Asch, Moure, Douglass, Roe, Gleason).
3. Resection of the entire deviated area, with preservation of the fibromucous covering on one or both sides (Krieg, Killian, Freer, Ballenger, et al.).

Experience has taught the utter failure of methods dependent upon crushing alone, owing to the impossibility of fracturing the uncut cartilage with forceps, as well as that of crowding a "redundant" septum into a nasal chamber too small to contain it. Most methods are based upon a combination of incision and fracture. It is an essential requisite for success by any method that the incisions should include the posterior portion of the deformity.

In undertaking a critique of the various methods of operation, I wish to disclaim at the outset any intention of reflecting upon the pioneers in this line of work, or of holding them responsible for failure to foresee the improvements that have since been built upon the foundations that they laid; nor need any feel slighted at failure on my part to discuss his special variety of procedure, inasmuch as these remarks will be exclusively confined to those methods with which I have had individual experience. Having no personal method to advocate, I believe that I may be exonerated from the imputation of partiality.

Here is no fitting place for a detailed description of the various standard methods, yet I cannot advocate too strongly a consultation of original publications by all those employing these operations.

The Asch Operation.—The modern treatment of deviated nasal septum may be said to date from the first operation of Morris J. Asch, of New York (1883). Prior to that time various procedures had been employed, successful in certain cases; but no systematic method existed, with detailed aftertreatment, such as that elaborated by him. This early received the recognition that its merit deserved, and for years has held the dominant position. First published in the "Transactions of the American Laryngological Association," 1890, this method has since been republished by so many different writers and in so many different forms that its technic should be familiar to every one. Yet the Asch operation, though one of the most extensively published, is still a most misunderstood and misapplied method.

In his final paper Asch emphasized the most important points in connection with the operation, and the main cause of failure or complication in results. The method is applicable to the cartilaginous septum only, and the forceps are intended neither for fracture nor for torsion, but for compression alone.

Observation of numerous operators will demonstrate that these restrictions are being constantly ignored. They should be engraved upon the mind, if not the instruments, of every one employing this method.

Another essential is that the crucial incisions shall be placed over the most prominent part of the deviation. Here we find the great defect of the Asch and similar fixed instruments, inasmuch as in high-grade bowed or angular deformities this is an impossibility, especially under anesthesia, even with the small-sized scissors now available. The horizontal ones are particularly hard to introduce, may strip off the mucous membrane, and are intended for exceptional use only.

Since the modification in the Asch splint by Emil Mayer, there have been no alterations in the method except that they are now boilable without change of shape. Kyle's modification of Mayer's splints, being made of block tin, are both aseptizable and malleable, so that they can be adjusted in situ, as occasion demands, and seem to have distinct points of advantage over the original ones. A longer size for posterior deviations is now available.

The suggestion first made by C. W. Richardson, of Washington, that the splints be left in the nose continuously for a period

of seven to ten days, with careful supervision, and then removed permanently, has simplified the aftertreatment in the many cases in which it has proven applicable.

Asch claimed five minutes as the average time of performance of the operation and four weeks as the average time of aftertreatment. The former constitutes the main advantage and the latter one of the disadvantages of the method.

While the Asch operation may be available in other varieties of deformity, it is best adapted to deviations of the cartilaginous septum without thickening, either evenly bowed or moderately angular, when there is ample room on the concave side. The deflection must be well above the nasal and vestibular floor, and not too pronounced, else the Asch instruments cannot be inserted properly.

An objection is that the crossing of incisions creates a point of deficient nutrition and favors sloughing and perforation. A further objection to the method is that, although a considerable surgical procedure, we must frequently resort to secondary operations under visual inspection to remove irregularities and obtain a result.

Experience has demonstrated that in the variety of cases to which it is especially adapted it yields excellent results, and if there be any method suitable for the general practitioner this is the one par excellence.

While recognizing the great merit of Asch's work, and not wishing in any anywise to undervalue its brilliant results, I do not think that his most valuable and enduring contribution to rhinology consists either in his operation or in his instruments, but in his demonstration of the extreme tolerance of the nasal septum of surgical interference—in contradiction of the ideas prevalent prior to his day; and in his elaboration of a system of aftertreatment after which all subsequent ones are patterned.

My personal experience with the genuine Asch operation has been somewhat limited, the majority of cases having been performed for purposes of demonstration to undergraduate and postgraduate students. This resulted from no prejudice against the method, but mainly from the character of my early cases, in which the nose was so narrow that the Asch instruments could not be inserted, compelling me to devise instruments of my own.

My early operations were upon the Asch principle, but the incisions were made with special knives devised by myself (1892). These originally presented a double-edged, triangular, pointed blade, at right angles to the shaft, but are now made with a rounded point and resemble somewhat an old-fashioned gum lancet. The shaft is graduated, so that, the distance of the point of the maximum deflection having been previously measured, operation under anesthesia is facilitated. There are two of these knives, one cutting horizontally and one vertically, and two lengths of blade, a short one for thin and a longer one for thick septa. These knives are usually inserted on the narrow side and the crucial incisions made clear through the septum at its most projecting portion. I have always regarded it as essential to cut entirely through the septum to enable me to satisfactorily fracture it with the finger, hence have seen no necessity for a guard on the blade.

Fig. 1.

In high-grade deviation, it has been at times easier to operate from the wide side, and then the narrow nostril must be protected from injury by the insertion into it of a thin plate of metal or of hard rubber.

These knives have the advantage that they can be used in an extremely narrow nostril and wherever the deformity is located, whether high up or near the floor of the nose. Having become skilled in their use and satisfied with the results, I have employed them in all of my subsequent septal work.

In early mixed cases, bony deflections were either fractured with Adams forceps at time of operation, or removed with saw and chisel subsequently. Later Roe forceps were used.

I have used successively the Asch, Mayer, the Berens cork and dental gutta percha, and Kyle splints. Whenever possible I have left the splints continuously in the nose for as reasonably long a period as possible (average eight days). Number of cases by this method, 45 (bowed, 19; angular, 26). Number of per-

forations, 5 (10 per cent.). Severe hemorrhages, 0. Results: Excellent in 5 per cent.; good in 70 per cent.; fair in 15 per cent.; failure in 10 per cent. A good record considering early lack of skill and that cases were not selected with the same discrimination as at present. A few illustrative cases are appended.

Miss L. J., white, female, age 14, 1900. Indications—nasal obstruction and excessive nasal and postnasal discharge. Type of deformity—markedly bowed and thickened septum obstructing right nostril (cause unknown). Compensatory hypertrophy of left inferior turbinal. Asch operation under ether with horizontal scissors, Adams forceps, Asch splints. Had to use great force and tenaculum to remove same on third day. Replaced by McKernon splint. Left inferior turbinal cauterized. Uneventful recovery in four weeks with fair result. Two years later resected a septal ledge from the right side with much benefit. This is an example of bad adaptation of operation to deformity. There was too great bowing, and both superficial and interstitial thickening of cartilage, for the best results by the Asch operation.

F. A., white, male, age 12, 1899. Indications—nasal obstruction. Weak eyes, very nervous. Type of deformity—generally irregular and thickened septum with extreme angular deflection of the cartilage occluding right nares, caused by a baseball bat. Tip of nose turned to the right, bridge somewhat flattened. Asch operation with my knives under Schleich's general anesthetic. Berens cork splints. Result a partial success, ridges remaining on both sides of the septum. About ten months later a Douglass operation was performed with same knives, under ether, McKernon splints. Result good as to respiration, some improvement of external deformity; nasal bone incurvated. This case was not primarily suitable for either of these operations, being too thick and irregular. Owing to the patient's age and extreme nervousness, an anesthetic was imperative, which would have handicapped the result by any other method (submucous).

F. S., white, male, age 34. Indications—headache radiating from nose to head; asthma. Deaf in left ear. Type of deformity—bowed deviation of cartilage. Asch operation under ethyl bromide; regular instruments. Mayer-Asch splints. Patient ran off with the splints in his nose and did not return for one year. Stated that he had removed the splints himself after four days. Functional result good and architectural fair. No perforation.

Dr. C., Egyptian, male, age 23, 1903. Right nasal obstruction. Type of deformity—cartilage bowed, moderate. Typical Asch operation under ether; genuine instruments. Splint in situ ten days. Typical case and excellent result.

C. A. G., white, male, age 16 years, 1898. Indications—nose stopped up completely. Mouth breather. Has had numerous nasal polypi and a postnasal fibroma removed by myself (snare); also a choanal polypus. Type of deformity—angular deviation of the cartilaginous septum to the right. Typical Asch operation (ether) and aftertreatment. Good result. The following year a retronasal fibromyxoma was removed. One year subsequently patient was well and married.

The principal improvement that I would suggest and have often carried out is the performance of the operation with knives under cocaine-adrenalin anesthesia in all suitable cases, under direct visual inspection. When used for compression only, the application of forceps is not very painful, and may be omitted when the septum is not very redundant and the fracturing with the fingers is thoroughly done; if the flaps are so long as to cause a thickening upon the wide side they may be resected at once, thus obviating a secondary operation.

Moure's Operation (*Revue hebdom. de Lar.,* No. 13, 1901).—This is due to a misunderstanding of and failure to keep up with the improvements in the Asch operation; it is largely used in France and England.

The operation is performed with a special pair of scissors resembling the Asch vertical one, having the blades set at an obtuse angle to the handles. The first cut is made as close as possible to the nasal floor and as far back as possible. The second cut is made without withdrawing the scissors, as close as possible to the dorsum nasi. The two incisions, which must not meet, form a movable triangular flap, which is pushed with the finger into the opposite nostril. A special metallic splint is inserted, and adapted by means of a dilating forceps to the septum, and left in position for seven or eight days, at the end of which period the septum is generally fixed in position.

This operation avoids the crucial incision, and separates the septum from the maxillary crest. The scissors are inserted without regard to the location of the deviation. It is very rapidly performed in from one-half to two minutes, and can be done under nitrous oxide or cocaine.

Moure supposes that the Asch splint is intended to be left in the nose during the entire period of aftertreatment, and urges that is cannot be kept clean. His splint is intended to obviate

this, but has no advantage over that of Kyle. An advantage claimed for this method is that there is no risk of ulceration, as the incisions are above and below the zone covered by the splint.

A limitation to the operation is that there must be plenty of room on the concave side, as the deformity is pushed over bodily into the other nostril. A further objection is that a fissure may ensue along the maxillary crest. The horizontal incision low down near the nasal floor might cause serious hemorrhage.

Miss S. O., female, white, age 25, 1904. Indications—nasal obstruction, mainly on right side. Type of deformity—moderate horizontal angular deviation of septal cartilage to the right. Moure's operation with Asch vertical scissors, under cocaine anesthesia. Simpson-Bernays splint. Result, cure in ten days.

The Douglass operation (*N. Y. Medical Journal,* August, 1898) differs from the Asch in that it is performed with a special perforator and knife, and not only the crucial incisions, but the crossing of incisions at any point, is avoided. The incisions are made along the lines of deflection in whatever direction and as far as they may lead, in the belief that these are the seats of old fractures; these lines are determined by preliminary examination, either tactile or visual.

The next step is to force the septum over into the unobstructed side with the finger. Certain modifications of his original method have recently been advocated by the author.

Having proved both by anatomical and by microscopical observation that the cartilaginous septum is never fractured by forceps, but, *per contra,* that it is torn loose from its articulations and its mucous membrane lacerated, the author has ceased to use the forceps for this purpose; he, however, deliberately attempts to separate the triangular cartilage from the bony septum with them.

The author lays particular stress upon the part played by the superior maxillary spine in maintaining the septum in its deviated position, and has adopted breaking it as a routine measure in his operations. This may often be accomplished by crowding the forceps down to the floor of the nose and twisting them from side to side, but it is better in most cases to cut the spine with chisel and mallet, either through the nose or by the supralabial method of Harrison Allen. Since the method of cutting this

spine has been adopted, it is often possible to remove the splints in five days. The author prefers to splints Bernays sponge, inserted in small strips.

With the finger as a protection, under anesthesia, or guided by the eye, under cocaine, there is but little risk of injury to the turbinals. I have therefore never employed the spear knife and the probe knife of Douglass, but have used the same vertical and horizontal knives as in the Asch operation. These can be inserted anywhere, wherever there is a deviation; hence there is no need of a perforator, which is a complicating and unnecessary step. There is no central point of insertion, but incisions may be made anywhere, hence meeting or crossing of incisions is avoided. It makes no difference from which side the incision is made, as the turbinals on the narrow side may be protected. In my earlier cases under this method, the operation was done under general anesthesia; later the incisions were made under cocaine and the nasal spine fractured when necessary with forceps, after preliminary incision (Kyle). I regard Douglass' proposition to deliberately "tear the triangular cartilage from its attachment to the septal plate of the ethmoid" with forceps as a distinct retrogression. This separation can easily be accomplished, as I have often done it, by a vertical incision with the knife under cocaine-adrenalin anesthesia and visual inspection; its articulation with the vomer can be similarly severed, when it is dislocated; or when the superior maxillary spine is deflected, this may be chiselled off either through the nose or by the supralabial route under cocaine or ether. Thus the forceps can be entirely eliminated, and the operation much simplified. It can be performed in from five to fifteen minutes. I have used the Douglass principle exclusively in thirty-seven cases of cartilaginous deviation and found it a scientifically conceived and successful operation in those cases to which it is applicable. I have had no serious complications or failures by it. This method is possible in the vast majority of simple cartilaginous deviations, but it is especially adapted to moderately angular or "ridged" deflections, extending in various directions or in markedly "angular" forms. In the "bowed" variety, a single horizontal or oblique incision is made along the greatest curvature.

This principle is also available for the removal of localized lines

of deviation, during or remaining after other operations (Gleason operation).

H. C. A., white, male, age 18, 1899. Indication—obstructed right nostril; external nose twisted to the right. Type of deformity—horizontal angular deflection of cartilaginous septum; dislocation from nasal crest, and thickening at nasal floor. Deformity of nasal bones. Cause unknown. Douglass operation under ether with my knives. Separation by incision from nasal floor. McKernon splints, removed by myself every second day for a week, then by patient every day for another week. Returned to business at end of first week, and had completely recovered in three weeks.

H. L. C., white, male, age 19, 1904. Indications—nasal obstruction on right side. Sense of smell lost. Epistaxis daily, from right side. Type of deformity—bowed deviation of cartilaginous septum to the right, central. Mucous membrane hemorrhagic. External depression on left side of bridge of nose; caused by a blow while playing basket ball. Douglass operation. Two parallel antero-posterior incisions with my knives through most protuberant area, followed by compression with Adams forceps. Dental gutta percha splint, worn continuously for ten days. Result excellent. External depression subsequently filled with paraffin.

H. H. T., white, male, age 30, 1905. Indications—nasal obstruction on right side. Type of deformity—vertical angular deflection at chondroethmoidal junction; also anteriorly, in body of cartilage joining these, an oblique angular deflection. Dislocation from nasal spine. Tip of nose turned to the left. Cause unknown. Douglass operation. An anterior and a posterior vertical incision and an antero-posterior oblique incision along the deflected lines with my knives, under 20 per cent. cocaine solution. Nasal spine fractured with Adams forceps under light etherization. Duration (including etherization) twenty minutes. McKernon splint for three days. Wry nose improved. Result excellent.

The Gleason operation was first presented to the Philadelphia College of Physicians in October, 1896. The technic is as follows (*Laryngoscope,* August, 1902). A U-shaped flap is cut out of the whole thickness of the septum (bone or cartilage) by inserting a thin saw beneath the overhang and sawing at first horizontally, and then vertically upward parallel with the septum. Both crura are then extended upward as far as possible with the saw. The incision must include the entire deviation and not pass

through it; the flap is then forced over into the opposite nostril with the finger, and an effort made to fracture its neck and destroy its resiliency; thus the pendulous flap is retained by the margins of the incisions, and there is seldom necessity for splints or other support. This operation can be performed in from three to five minutes, in simple cases, under cocaine-adrenalin anesthesia, with a minimum of pain or reaction, and gives ideal results in suitably selected and well-performed cases. An essential point in the success of this method is to completely free the flap, by passing the finger or a curved knife around the incisions, so that it may be subsequently efficiently fractured. It is particularly indicated in pronounced deflections with an overhang, especially the angular form, and gives the best results when the deflection involves the bony septum; we then have a redundant flap and one containing bone, which is readily fractured. This remains in situ without the use of a splint. Cartilaginous, slightly bowed deformities are probably corrected better by the Asch, Douglass, Roe or other methods.

It is not adapted to deviations without an overhang, whether bowed or angular, although in some cases with but moderate overhang a start may be obtained by using Phillips' bevelled edge saw. It is especially effective in vertical or horizontal angular deviations involving only a limited area of the septum; in such cases it is only necessary to push the long tongue-shaped flap through the septum without fracturing it. It is not adapted to very thin or excessively thick septa; the former buckle and tend to return to the deviated position; whereas it is difficult and painful to saw through very thick septa, especially when containing bone; also in thick septa it is sometimes difficult to fracture the neck of the flap, in which case this may be facilitated by incompletely incising it with Kyle's saw or Fetterolf's saw file.

In deviations extending far back into the bony septum, the posterior arm of the U-shaped incision is more effectively made with the saw through the wide nostril; deformities located in the extreme posterior regions are better corrected by other methods. This also holds true in regard to sigmoid deflections, and those near the floor of the nose.

Deformities in the body of the flap, or irregularities left in the formerly obstructed nostril, may have to be removed by subse-

quent operation; it is well, however, to give nature a chance to adjust these spontaneously.

Since I first became acquainted with this method in 1897 I have used it in every deformity in which it was applicable, expecially in "mixed" forms (three cartilaginous and twenty "mixed" cases) with the most eminently satisfactory results. Contrary to the originator's experience, I found it very satisfactory in two cases of mixed deformity in children, owing to the simple after-treatment.

B. S. M., white, male, age 40, 1901. Indications—nasal obstruction, repeated colds in winter, especially in the larynx. Excessive smoker and drinker. Moderate arteriosclerosis. Type of deformity—bowed cartilage to the right, smooth surface, moderate overhang at nasal floor. Cause unknown. Gleason operation, with saw and knife. Incision begun with bevelled saw.

Fig. 2.

Cocaine locally, eucain injected. Duration ten minutes. Kyle-Mayer metal splint to prevent anticipated hemorrhage. Secondary hemorrhage due to edge of splint catching in wound and preventing coaptation of edges. Result perfect as to function and appearance; can scarcely detect site of operation.

Dr. W. B. C., white, male, age 29, 1901. Indications—nasal obstruction, left side; frequent colds and catarrh. Type of deformity—marked ascending angular deviation of cartilage and bone (chondro-vomero-ethmoidal) to left side. Cartilage very thick. Cause unknown. Gleason operation with saw. Difficult on account of septal thickness and development of bone in cartilage. Duration fifteen minutes. Cocaine. No splint. Result good. Slight synechia at floor in unobstructed side; no consequence. Septum too thick for this operation.

Roe's operation ("Transactions American Laryngological Association," 1900) consists essentially in the use of a special fenes-

trated forceps, by means of which either the cartilaginous or the bony septum may be fractured. Roe's forceps for a long time constituted the only safe and successful means of fracturing the bony septum, and my personal experience is limited to their use for this purpose, mainly as an accessory to some other method. Inasmuch as even this instrument is not free from the possibility of danger, it has been suggested to control the line of fracture by means of preliminary fissure with the trephine or saws; another resource is to use a male blade smaller than the one intended to go with the female blade of a given size. This instrument is especially useful in limited mixed deviations at the chondro-osseous articulations. In my opinion no rhinologist's equipment is complete without it. I have performed this operation under cocaine with satisfactory results and no complications.

Fig. 3.

N. J., white, male, age 49, 1899. Indications—obstructed right nostril, pain over right eye, purulent discharge and right frontal empyema, nervousness. Type of deformity—bowed deviation of face of ethmoid, completely concealing the middle turbinal on left side. Frontal empyema. Defective drainage. Roe operation. Perpendicular plate of ethmoid fractured under cocaine and forced over; no incisions owing to presence of pus; left middle turbinal resected. Irrigation of frontal sinus with catheter. Cured in thirteen months.

Miss O. Z., white, age 18, 1904. Indications—nasal obstruction on right side. Type of deformity—bowed deflection of cartilaginous septum to the right, with angular vertical deflection at chondroethmoidal junction. Douglass operation combined with Roe forceps. Two parallel incisions through cartilage, under cocaine-adrenalin anesthesia, associated with crushing of vertical ridge with Roe's forceps, guarded by saw incision (Kyle). Duration ten minutes. Dental gutta percha splint for four days. Result good.

Mrs. S. B., white, age 49, 1902. Indications—epiphora; mucocele. Pain in right nostril. Lacrymal probe has been punched through the duct into the middle meatus. Type of deformity—angular deviation and crest high up at vomeroethmoidal junction. Operation—saw incision and crushing with Roe forceps. Resection of middle turbinal. Result—operative excellent. Referred to eye surgeon.

The Kyle-Fetterolf operation (*Laryngoscope,* August, 1902) is more available as an accessory to other procedures than as a distinct method, although undoubtedly successful in certain cases of irregular and thickened septa.

Bosworth's and *Krieg's* methods differ merely in degree, the latter being an extension of the former. In each preservation of a flap of mucous membrane upon the convex side may be attempted.

Bosworth's plan of "sawing a new septum out of a thick and crumpled one, just like a straight board is sawn out of a crooked log" is applicable in cases of very thick septum.

Fig. 4.

Miss S. L., white, age 17, 1902. Indications—double nasal obstruction; can breathe a little through left side. Right ear slightly hard of hearing. Type of deformity—telescoped and thickened septum deviated slightly to the right, caused by falling against a post in childhood. Roman nose, nasal bones convex. Left one incurvated to the right side. Depression beneath each one. Resection of a slab from the septum with Bosworth's saw, below on left and above on right (bone), under cocaine at two sittings. Subsequent paraffin injection into external depression at two sittings (Harmon Smith method). Breathing capacity and external appearance of nose greatly improved. Is now being catheterized for ear trouble.

Miss A. G., white, age 17, 1902. Indications—absolute occlusion of left nostril. Hears loud voice only. About one year

previously an unsuccessful operation was performed. Type of deformity—hypertrophied septum with bevelled overhang low down in floor of nose. Cause unknown. Complete synechia between inferior turbinate and septum; not even a fine probe can be passed through left naris. Operation—Krieg's "fenster" resection. An extensive fibrous synechia was first sawn through, and then an ellipse sawn bodily antero-posteriorly out of the cartilaginous and bony septum. The resected mass had to be removed peacemeal with bone forceps. A Simpson rubber-covered splint was used for four consecutive days. Uneventful recovery ensued. Considerable improvement of hearing resulted immediately, which has not been materially increased by subsequent catheterization.

The Submucous operation should be defined as the removal of larger or smaller areas of the septum in between the mucoperichondrial and mucoperiosteal layers, and should not be applied to the mere preservation of larger or smaller shreds of soft tissues upon the convex side. It has been recently so fully and ably discussed by Krieg, Hajek, Menzel, Jansen, Freer, Ballenger, and others as to warrant but little further mention.

This type of operation is based upon the assumption that the septum is a mere partition and not a support of the external nose. I am not alone in believing that the last word has not yet been said as to the harmlessness of this procedure, and that a future generation with sunken noses may live to witness our mistaken conceptions and overzeal in this matter.

While it may be feasible, personally I do not believe that it is indicated or justifiable in all varieties of deformity, any more than the operations which have preceded it.

At present it is being enormously abused. Final judgment cannot as yet be passed upon the method; it supplements the others and constitutes an operative advance so great that the word "inoperable" may almost be removed from septal terminology. I believe that ultimately it will be employed in these hitherto inoperable and other difficult cases, as well as in simple cases in which very limited resection is necessary. Extensive resection for the relief of minor deformities is not defensible.

My personal experience consists of six cases by the Killian and nine by the Freer method; all of these were carefully selected cases of complex cartilaginous or bony deformities. All gave excellent results, with the exception of a small perforation

in two cases. In my hands the operation has required from thirty to sixty minutes, and both the patient and myself have felt the physical effects of the seance. I have performed two operations under general anesthesia by this method, one in a child and one in an adult; they were attended with such difficulty that I shall hereafter resort to other methods when forced to operate under these conditions.

We have also another type of operation, performed externally, which is particularly applicable under general anesthesia; of these the simplest is that of *Harrison Allen* (A. A. Bliss, "Transactions American Laryngological Association," 1901).

This consists in severing the maxillary crest by means of a small chisel placed beneath the upper lip; the mobilized septum is then forced over with the finger, and retained in position with a splint until it becomes fixed. The operation is usually done under light etherization, although it may be successfully performed under cocaine injection. This operation is indicated in a well-defined class where there is a displacement of the whole mass of the partition, so that its whole lower border rests on the floor of one or the other nostril. There is little or no curvature of the surface, but there is always more or less bending of the anterior nasal spine toward one or the other nostril, often combined with hyperostosis, so that the vestibular floor is converted into a narrow fissure.

It is also very valuable as an accessory to other methods (Asch, Douglass).

Mrs. S. A., white, age 28, 1900. Indications—nasal obstruction on right side, so that she must hold the wing of the nose aside in order to breathe. Also external nasal deformity, consisting in a distortion of the tip to the left, a depression of the bridge to the right of the median line, and a lump to the inner side of the tip, due to the fracture of the upper lateral cartilage. Type of deformity—internally a translation of the septum to the right, dislocation from nasal crest, with thickening at the nasal floor. Cause, a fall on the tip of the nose in childhood and running against a door in the dark in adult life. Harrison Allen operation, ether. Uneventful recovery. Septum a little overcorrected. Subsequent resection of lateral cartilage, through the nose.

Loewe's operation is applicable in anomalies situated on the most anterior part of the septum; under general anesthesia, best

after preliminary Schleich infiltration of the septal mucous membrane, an incision is made through the mucous fold of the upper lip, just above the gum, extending from first molar of one side to that of the other, and clear to the bone. The soft parts are then separated from the bone, until the under border of the pyriform fossa is in view. The inferior and anterior borders of the cartilaginous septum are then denuded of the soft parts by means of shallow longitudinal incisions along the anterior nasal spine. The mucous membrane should not be perforated, as the whole operation should be extranasal. A raspatory, bent on the flat, is then inserted beneath the inferior turbinated body and from thence the lateral nasal wall, the nasal floor, and the septum are undermined. The nasal floor must invariably be first loosened, else the mucous tube will inevitably be torn.

After elevation of the mucous membrane, the anterior inferior parts of the quadrangular cartilage are exposed, as well as the lower half of the aperture. Alterations in the anterior segment of the septum can now be removed as exactly as if one had before him, not the living man, but the skeletized skull. With deformities lying behind and above, resection of the septum may be accomplished after preliminary decortication of the face (see Loewe's "Atlas").

C. L., female, age 10, November, 1905. Indications—mouth breather. Has had adenoids removed twice in three years, once by myself. Slightly deaf. Has repeated attacks of acute bronchitis. Is so nervous that she can scarcely be examined. Type of deformity—congenital nasal atresia. Extensive horizontal mixed deviation and ledge near nasal floor, anteriorly on left side. Loewe's operation, ether. Resection with saw chisel and bone forceps. Mucous membrane preserved. Considerable reaction, cold compress, gauze packing, cure in three weeks.

Another form of this operation is that used by *Gaudier.*

The patient being anesthetized with chloroform, the operator, seated upon a high stool, takes the head between his knees with the face up. The posterior nares are tamponned beforehand, and the nasal mucous membrane, both turbinal and septal, is mopped with adrenalin. The lower border of the cartilaginous septum is then separated from the cutaneous, with a single horizontal cut of bistoury or scissors. The nares are vertical and all

maneuvers are made from above downwards. The lip is now forcibly retracted and a free incision made in the sublabial furrow, extending 1¼ inches upon either side of the frenum. Bleeding vessels are seized and ligated at once; the wound is then retracted, and we see at the bottom of the lozenge-shaped wound the two nostrils wide open, with the septum in the middle. Oozing is arrested by tamponnade. At this period an assistant replaces yourself in retracting the lip and illuminates the field with an electric light. Beginning at the cut edge of the septum, you separate the mucous membrane with an elevator (Freer's instruments available), first from the concave side and then from the convex, until the entire deformity is denuded. The septum is then resected with punch forceps, until the deviation has been completely removed. If the nasal spine takes part in the deviation, it may be removed with gouge and mallet without any trouble, and as far back as you please. The nose and lip are then replaced and sutured in position with catgut. The writer then inserts nasal splints and carries out the usual aftertreatment.

The oral method permits general narcosis, a wide operative field, and is applicable to all patients without exception. It is especially applicable to unruly children of any age. The technical difficulties are fewer than in the ordinary submucous operation.

Every case of septal deviation is an individual one, and its correction a matter of individual study. Deformities vary from simple deflection to forms so complex as to defy description or illustration.

There are many methods of correcting these deformities, varying from a simple, single incision, to maneuvers so complicated as to deserve the name of plastic operation. The majority of operators combine the best features of all of these methods.

To variable deformities must be adapted an equally variable treatment.

The simpler classical forms have already been fully described in considering the standard operations adapted to their correction.

Complicated deformities and corresponding operations:

T. P., white, male, age 16, 1895. Indications—tip of nose turned to the left, bridge broad, and left nasal bone displaced. Type of deformity—marked angular deviation of cartilaginous

septum to the right; dislocation from nasal spine and projection of edge of dislocated cartilage into left nostril. Denies any injury. Gleason operation, combined with resection of project-

Fig. 5.

ing ledges, gave excellent results. In a marked case of this type I should probably now perform a submucous operation.

W. J., white, male, age 17, 1898. Indications—nasal catarrh;

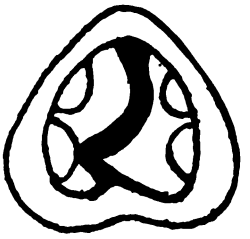


Fig. 6.

constant nasal obstruction on the left side. Left ear dull. Smell impaired on left side. Type of deformity—septum deviated to the left above (bowed) and right below (angular). Operation—Roe

Fig. 7.

forceps controlled by incision with a saw. This is a typical deformity for correction by the submucous method.

An unusual type of deformity is where we have a deep pocket upon the concave side, which may be either funnel or cup-shaped, and a corresponding conical or spheroidal protuberance upon the convex side, just as though the cartilage were embossed. There is much redundant tissue and its correction is difficult. By sawing off the apex of the prominence, followed by knife incisions on the Asch or Douglass principle, the deformity can be corrected, but much judgment is required.

W. P., white, male, age 12, 1903. Indications—feeling of suffocation, mouth breather, nasal speech, inattentive, adenoids. Type of deformity—spheroidal protuberance of cartilaginous septum to left; cup-shaped hollow on right side. Operation—adenoid removed. Incision with knives and replacement with finger under chloroform. McKernon splint, removed on fourth day. Result reported to be good by patient's physician.

In the majority of cases, the submucous would be a better operation for this type of deformity.

A type of deformity that has not received the attention that its frequency warrants is separation of the cartilaginous plates of the septum. We may have simple projection of the lower edge of the cartilage ("pyramidal" dislocation), single or double, or "flaring out" of its entire surface on one or both sides; again there may be a protrusion of the plate on one side, bowed or angular, and a flaring on the opposite side; or both plates may be bellied out into each nostril, the intervening space remaining as a hollow cavity, or becoming filled up with fibrous tissue (biconvex or spindle shaped). This variety is often seen in the noses of Hebrews, in whom the septum occupies the whole nasal chamber. Multiple incisions (Kyle-Fetterolf) and compression, followed by splints, will correct moderate degrees of fibrosis. The submucous operation is not suited to this form; the Ballenger swivel knife will not straddle the hypertrophy, nor the Freer knives penetrate it, nor the Grunewald forceps cut through it. Probably the best procedure is to saw out the deformity en bloc, either by Bosworth's or by Krieg's method (which see). We should endeavor to preserve the mucous flap if possible. The thickened form may present an even surface, or the cartilage may be telescoped and crumpled, giving it an extremely irregular

surface. The term "bullous" or "vesicular" should be reserved for curved separation of the plates, inclosing a distinct interspace or cavity.

E. J. S., white, male, age 13, 1906. Indications—nasal obstruction, most marked on right side. Underdeveloped. Type of deformity—vesicular bowed deviation of cartilaginous septum to the right, following a fall on the nose four years ago; separation of plates, lelt plate projecting into right naris below. Operation

Fig. 8.

—Ballenger-Freer submucous resection of both plates. Duration forty-five minutes. Result excellent; sent home in two weeks practically well.

W. E., white, male, age 14, 1904. Indications—complete nasal obstruction on right side. Dulness of hearing, discharge at times, not at present. Type of deformity—vesicular bowed deflection of right septal plate completely closing right naris, due to a fall upon the nose. Operation—Freer's (old) submucous resection

Fig. 9.

of right septal plate under cocaine, left plate left intact. (My first submucous operation.) Duration thirty minutes. Adenoid removed. Result excellent. Patient sent home in one week almost well. Gained ten pounds in weight in a few weeks subsequently.

R. G., white, male, age 50, 1906. Indications—dull pain at root of nose. Complete nasal obstruction at all times on left side. Repeated head colds. Excessive nasal discharge. Type of deformity—external nose deflected to right, left nasal bone incurvated to right. Complex deviation of cartilaginous septum to left side, concave on right side, due to a fist blow in boyhood. Left septal plate separated, with an anterior and posterior vertical angular deviation and a superior and inferior horizontal angular one, terminating abruptly above nasal floor (overhang); entire deviation can be circumscribed with a probe. Operation—Freer

Fig. 10.

(improved) submucous resection, both plates; cocaine, mop, and infiltration, one-half per cent. Duration forty-five minutes. Recovery in three weeks. Result excellent.

Some deformities are so complex and the operations for their relief so intricate that they deserve to be classified among the performances of plastic surgery.

Indications: A medical man, 23 years of age (1901), as the result of a football injury some years before, presented complete nasal occlusion on the right side and consecutive postnasal and tubal catarrh.

Type of deformity: The septum has been fractured horizontally into the bony septum; the upper segment completely separated from the lower and carried into the opposite nostril, where it became embedded in hyperplastic material and adherent to the floor of the nose; the right surface of the triangular cartilage presented almost vertically at the right nostril. A fine probe could scarcely be inserted between the cartilage and the lateral nasal wall. A vertical ridge one-half inch in height ran anteroposteriorly along the floor of the nose, consisting of bone with a capping of cartilage; between this ridge and the septal plate was a deep pocket on the concave side.

A modified Gleason operation was done under local anesthesia (cocaine 20 per cent. mop., eucain 5 per cent. by injection) and adrenalin, and was almost painless and bloodless; duration about one and a half hours. The vertical ridge was first denuded (b); then with a saw and knife a modified Gleason U-shaped flap was made (a), consisting of bone and cartilage, and forced over this

ledge into the opposite nostril. To lessen the resiliency of a much thickened septum, a horizontal groove was cut in the neck of the flap along its greatest convexity (c). No splints were employed; ice compresses. Considerable postoperative hemorrhage ensued, causing some worry, which yielded, however, to continued cold. After two days' rest convalescence began and continued without event. After recovery a vertical ledge was seen in the right nostril posteriorly at the point of section, which was easily

Fig. 11.

removed with cutting forceps about one month after the first operation. There is considerable redundant cartilage in the floor of the right nostril, but, as respiration is free and the ear can be satisfactorily treated, no further operation is contemplated. Previous to these operations a submucous cauterization had been done on a hypertrophied left inferior turbinate.

In this same category belongs a case of extreme displacement of the nose reported by Mayo Collier.

The dislocation of the external nose was extreme, the tip being under the right eye. The left nostril had been occluded for fourteen years, and very little air entered the right. The septum was pushed over to the left side and literally lined the outer wall of the left nasal fossa. The right cavity was correspondingly enlarged, and a very large lower turbinal body occupied the concavity of the septum. A fine keyhole saw was forced into the lower meatus and the ridge of the maxillary and palate bones divided and removed. The vertical plate of the ethmoid bone was then fractured and pushed over to the opposite side. Some of the cartilaginous septum was removed. The result was, so far, all that could be wished—a nearly straight nose and ample nasal respiration. No splints or supports of any kind were used.

In my judgment neither of these cases was suited to the submucous operation.

A difficult deformity consists in a marked spur or ledge (chondroexostosis) in the region of the nasal spine, associated with

mixed deflection. This is in contact with the external nasal wall and almost in contact with the nasal floor.

The insertion of any instrument around the deformity is impossible, and the growth is too dense for the use of forceps.

The use of mallet and chisel associated with the supralabial operation seems most feasible. The only case that I have had was for special reasons treated by Loewe's operation.

Conclusions.—Modernization rather than abandonment of the older methods is what is needed. The majority of cases can be satisfactorily treated by short operations under cocaine-adrenalin anesthesia, and this should be employed whenever possible. The use of cocaine admits of exactness in placing a limited number of incisions with adjustable instruments, under visual inspection, in the location where they will be most effective. Success depends more upon thoroughness and exactness in making the primary incisions than any other element.

One of the most valuable contributions of the submucous operators has been the demonstration of how much the patient can stand under cocaine anesthesia. The general surgeon, too, having learned from us the skilled use of this agent, is now showing us its great possibilities. For instance, removal under Schleich infiltration anesthesia of the hyoid bone, part of the base of the tongue and of the pharynx, as well as the larynx, recently performed upon a patient of mine.

When it is skillfully applied the simplified deviated septum operation should be practically painless under cocaine. By selecting our patients with discrimination in regard to their physical and nervous stamina, and employing the semirecumbent position, much of the supposed toxic effects of cocaine may be avoided. When applied to the septum alone there is an intense local effect and but little absorption. Adrenalin is a physiological antagonist to this toxic action, increasing its anesthetic effect by holding the cocaine in the tissues and producing ischemia. I always administer a full dose of strychine before the use of strong solutions of cocaine, and always prepare my cocaine solutions fresh for each person, by dissolving tablets in warm sterile solution of adrenalin, 1-2000, contained in a graduated minim flask, so that the exact quantity used can be determined. By this means I have avoided the poisonous and increased the anesthetic action of the cocaine.

For submucous infiltration a ¼ to ½ solution of cocaine in 1 to 2000 adrenalin solution may be used.

When the nasal spine is to be cut a subperiosteal injection of a 2 per cent. solution of cocaine in 1 to 5000 adrenalin may be made along the nasal spine on both sides; the insertion of a pledget of cocaine beneath the upper lip intensifies the anesthetic action.

In difficult cases all the preliminary incisions should be made under cocaine and the painful part (use of forceps, etc.) done under light general anesthesia. Ethyl chloride would seem an ideal anesthetic for this purpose on acount of its safety, rapidity of action and ischemic effect upon the nasal mucous membrane. After its use it is necesary for the nose to be plugged for fear of secondary hemorrhage. Prolonged general anesthesia is now seldom required in these cases.

If we would pursue the standard operations with the same assiduity and pertinacity as the submucous, aiming at improved technic and increased skill, we would obtain in properly selected cases, by these less severe and exhausting methods, results in no sense inferior to those by the submucous.

The trend of operative improvement should be toward simplification of technic and shortening of duration, rather than toward complexity. All obsolete and unnecessary instruments or maneuvers should be eliminated. In a large percentage of cases the use of forceps, either as a crushing or a compressing instrument, is ineffectual or unnecessary.

Fracture and replacement with the finger is efficient and painless when the incisions are made completely through the cartilage. Therefore, this, the most painful step of the septal operation, can often be omitted. In certain cases incision of the nasal spine with a chisel, either through the nose under cocaine or by the supralabial method of Harrison Allen, is an efficient substitute for their use.

The use of splints is extremely objectionable and should be abbreviated or eliminated whenever possible. When the primary fracture is thoroughly done, especially if the nasal spine is fractured or incised, splints will be required for but a short time. Having used all varieties of splints I have latterly employed selvedge-edge strip gauze, or Simpson-Bernays compressed cotton, dusted with bismuth or saturated in situ with camphor-menthol solution in albolene, which will remain in the nose several days without becoming foul.

We now have a number of time-tested and successful operations, each one especially adapted to one or more of the infinite variety of deformities. It is a mistake to claim that every operation will correct all varieties. Operations must be selected and adapted to individual deformities, and it is often a difficult matter to decide which operation is best in a given case. I believe that success is as much dependent upon good judgment in this respect as in marked operative ability; here the tyro fails.

In this line of work, ingenuity, dexterity and versatility are also requisite. Quickness in operating develops with experience, and I am sure that as skill and facility increase these operations can be made less formidable and more satisfactory.

There is no line of work in which the adage "practice makes perfect" is more applicable than to septal deformities; it is significant that the originators of these operations all claim better results from them than others obtain, and that all operators report their accidents or failures mostly in their early cases. We must therefore become experts in several methods, as we may have to combine one with the other (Douglass-Roe; Roe-Kyle; Douglass-Allen, etc.).

I for one am not willing to relinquish operations by which I am able to obtain satisfactory results in suitable cases in five or six minutes, actual operating time, in favor of those requiring from six to ten times that long, and much endurance on the part of both patient and operator. Moreover, we will find many more patients who can endure the limited strain of these short operations than the prolonged strain of the submucous.

As to which of these methods have stood the test of time and experience, and which can be discarded as superseded by better ones, each is entitled to his individual opinion. I venture to assert, however, that the Asch, Douglass, Gleason and H. Allen methods, and the Roe forceps and Kyle saws and splints will continue to be used in suitable cases, as long as there are septal deviations to be corrected.

Dissatisfaction with the new method is already appearing, and I am sure that in a short time there will be a reaction in favor of the older operations, and that in some cases a better result can be obtained by the old methods than by the new. Although the submucous operation belongs to the most difficult of nasal operations, all agree that it is indispensable, and a method that every

one who aspires to the title of a modern nasal surgeon must master.

The writer is fully aware of the incompleteness, imperfections, and possibly the incorrectness of these views, but this has seemed to him to be a direction toward which our attention might profitably be turned at this time.

Literature.

Asch, M. J. Treatment of Nasal Stenosis Due to Deflective Septa. Laryngoscope, June, 1899.

Ballenger. Annals of Otology, Rhinology, and Laryngology, June, 1905. Also Penn. Medical Journal, March, 1906.

Bosworth, F. Diseases of the Nose and Throat. Wm. Wood & Co., N. Y., 1896.

Collier, Mayo. Extreme Displacement of Nose. Journal of Laryngology (English), January, 1903.

Douglass, H. Beaman. Septal Fallacies. Laryngoscope, 1903.

Douglass. Nose and Throat Surgery. F. A. Davis Company, Phila., 1906.

Fetterolf, Geo. A Simple Method of Correcting Certain Deformities of the Nasal Septum. The Laryngoscope, Aug., 1902.

Freer, O. T. Trans. American Laryngological Assoc., 1905.

Gaudier. Traitement des deviations de la cloison nasale, resection sous-muquese par la voie sous labiale. Rev. Hebd. de Lar., No. 40, 1905.

Gibb, J. S. Deviation of the Nasal Septum. A review of 100 operations for correction. Trans. Sec. Laryngol., American Medical Assn., 1904.

Killian. Annals of Otology, Rhinology, and Laryngology, June, 1905.

Krieg. Atlas. F. Enke, Stuttgart.

Kyle, D. Braden. Diseases of the Nose and Throat. W. B. Saunders Company, Philadelphia, 1904.

Loewe. Zur Chrurgie der Nase. Verlag O. Coblentz. Berlin, 1905.

Mackenzie, J. N. Abuses in Intranasal Surgery of To-day. Trans. American Laryngological Assoc., 1904.

Mayer, Emil. Dislocation of the Cartilaginous Nasal Septum. Its Cure. N. Y. Med. Jour., 1895. Trans. New York Academy of Medicine, 1898. Trans. Sec. Laryngol., American Medical Assn., 1903.

Mouret, J. De la resection sous-muquese du squelette de la cloison nasal devie. Revue hebd. de Laryngol., No. 43, 1905.

Richardson, C. W. Trans. Am. Lar., Rhin. and Otol. Soc., 1898.

Robertson, Charles M. Observations on Different Forms of Operation for the Correction of Septum Deformities. Chicago Medical Record, 1905.

Roe, J. O. The Correction of Deviations of the Nasal Septum, with Special Reference to the Use of the Author's Fenestrated Comminuting Forceps. N. Y. Medical Journal, April 13, 1901.

Sëmon, Sir Felix. Some Thoughts on the Principles of Local Treatment in Diseases of the Upper Air Tract. The Macmillan Company, N. Y., 1902.

Smith, Harmon. A Consideration of Septal Spurs and Deflections. International Journal of Surgery, December, 1904.

(*Candidate's Thesis.*)

THE CLINICAL ANATOMY OF THE TONSIL.

BY WILLIAM LINCOLN BALLENGER, M.D.

THE tonsil is situated in the sinus tonsillaris between the faucial pillars and has its origin in an invagination of the hypoblast at this point. Later the depression thus formed is subdivided into several compartments, which become the permanent crypts of the tonsil. Lymphoid tissue is deposited around the crypts, and thus the tonsillar mass is built up. The inner or exposed surface, including the cryptic depressions, is covered with mucous membrane, while the outer or hidden surface is covered by a fibrous capsule.

It will be observed that the tonsil is an encapsulated organ, and it is characterized by from eight to twenty crypts or tubular depressions. Many practitioners have confused the tonsil with the follicular tissue immediately surrounding it. So long as they were able to remove follicular tissue through the wound in the sinus tonsillaris they thought they were removing tonsillar tissue. In this they were mistaken, as the lymphoid tissue immediately surrounding the tonsil is not encapsulated, nor is it characterized by cryptic depressions.

The tonsil does not always completely fill the sinus tonsillaris, the unoccupied space above it being known as the supratonsillar fossa, into which several crypts usually open.

The outer aspect of the tonsil is loosely attached to the superior constrictor muscle of the pharynx, thus subjecting it to compression with every act of deglutition. The palatoglossus and the palatopharyngeus muscles of the pillars also compress the tonsil. Grober cites authorities who claim that the compression of the muscles forces food and bacteria into the crypts.

The plicatriangularis is an offshoot from the posterior border of the anterior pillar. It begins above at the margosupratonsillaris and extends downward and backward, widening as it goes, and is attached to either the tonsil or to the posterior pillar, or to both.

The Crypts.—The crypts are usually tubular and almost invariably extend the entire depth of the tonsil to the capsule on its outer surface. Some, however, are compound, i. e., they divide below the surface into two or more tubules. They are usually comparatively straight, though they may be tortuous in their course. I have examined many tonsils removed with the capsule intact, and have rarely found crypts that did not extend through the follicular tissue to the capsule. Those opening in the supratonsillar fossa usually extend downward and outward, whereas in the lower portion of the tonsil their direction is outward. The area occupied by the mouths of the supratonsillar crypts constitutes, according to Killian, the hilus of the tonsil. Clinically, the crypts seem to be the source of the greatest amount of local and constitutional disturbance, as they often become filled with food, tissue debris and bacteria. This is especially true of those capped over by an overlying membrane, as in the supratonsillar space, and the antero-inferior portion of the tonsil, which is covered by the plicatriangularis. The plicasupratonsillaris does not, in all cases, enfold the hilus, or supratonsillar crypts, as the tonsil often fails to fill the supratonsillar space. In other instances it closely hugs the upper end of the tonsil, thereby completely closing the mouths of the crypts. It is in these cases particularly that the contents of the crypts are retained. This is also true in reference to those covered by the plicatriangularis.

Reasoning from a mechanical point of view, one reaches the conclusion that the retention of the infected secretions must necessarily give rise to infectious inflammatory processes. Clinically, we know that this is not true. The crypts are often found filled with food, tissue debris and pathogenic bacteria, without any appreciable inflammatory reaction. Nevertheless, as I shall amplify later, the mechanical closure of the crypts by the plicasupratonsillaris and the plicatriangularis adds greatly to the tendency to inflammatory and other morbid local and general processes.

It may be stated as a general law in physiopathology that *mechanical obstruction to the drainage of any secreting cavity tends to result in local morbid processes, and in toxic or infectious manifestations in remote parts of the body.*

The Epithelium.—The free surface of the tonsil, including the crypts, is covered with stratified pavement epithelium, the deeper

layers of which are columnar in type, while the superficial are pavement. Goodale has shown that certain coloring matter, when dusted in the crypts, is readily absorbed into the interior of the tonsil. He claims that the absorption probably takes place through the interspaces between the cells. From this the inference might be made that bacteria are absorbed with equal facility. This conclusion does not, however, coincide with either physiological or clinical data. Jonathan Wright has shown that there is a vast difference in the absorptive power of the tonsil for dust and for bacteria. He dusted the crypts of the tonsil with carmine powder and bacteria and excised it fifteen minutes later. The microscope showed the carmine particles in great abundance beneath the epithelium and within the intercellular spaces, whereas no bacteria were found. He also observed that the carmine dust remaining on the outside of the tonsil was easily washed away, while the bacteria were more difficult to remove. The adherence of the bacteria to the live animal membrane and their failure to pass through it, he ascribed to the viscosity of the bacteria, a biomechanical property of micro-organisms. The mechanical affinity existing between the bacteria and a living mucous membrane he described as one of their defensive and offensive properties of a biomechanical kind, as distinguished from their biochemical products, the toxin and endotoxin. Dust or carmine powder does not possess this adhesive property, hence it is readily absorbed, whereas the bacteria are not.

We know, however, from abundant clinical experience that there are conditions under which the bacteria are absorbed through the cryptic epithelium in sufficient numbers to excite marked local and constitutional disturbances. Apparently, the adhesive property of the bacteria has been overcome, or the toxin of the micro-organisms within the crypts has converted the live epithelium into inert matter through which it readily passes. Wright again says: "From experiments of Goodale and others with colored granules, from my own observations of dust particles passing the epithelial layer in health, and bacteria passing it in disease, it is evident enough that there must be something beyond mechanical obstruction, which, under ordinary conditions of health, keeps the tissue beneath the epithelium free of bacterial life, which swarms in some of the crypts on the outer side of the

epithelial cells. Hitherto the revelations of the antitoxic power of the blood sera have been insufficient to explain the problem. That explains the nullification of the toxic power of the pathogenic germ after it passes within the tissues, but it does not explain immunity from infection, to translate literally, the freedom from the carrying in the germ. It seems probable from experimentation with various forms of protoplasm that the animal organism evolves defensive properties to destroy by lysis, when the system through lack of execretory power becomes embarrassed by their presence."

Wright further says that "bacterial protoplasms may excite bacteriolytic ferments in the epithelial cells, a property heretofore referred by Metchnikoff to the leucocytes only." In these ways he attempts to show equilibrium existing in health between immunity and infection. An imbalance of this equilibrium is effected by a loss of local tonicity or health, infection then taking place.

In the epithelial lining of the crypts we find, therefore, the following properties:

a. A biomechanical resistance to the invasion of micro-organisms.

b. A biochemical destruction or taming of the micro-organisms in the crypts through the agency of a ferment thrown out by the epithelium under the stimulus of the retained bacteria. This process is known as bacteriolysis.

c. So long as the epithelium of the crypts is in a state of tonicity or health, an equilibrium between immunity and infection is maintained. When the cellular tonicity is impaired, the equilibrium between immunity and infection is lost and infection occurs. When the crypts are closed by the plicasupratonsillaris and plicatriangularis, or by the secretion in the mouths of the crypts, a very active warfare between the retained micro-organisms and the epithelial cells is begun. The cells throw out a poisonous ferment, whereas the bacteria throw off a toxin for the purpose of impairing the tonicity of the epithelium. If the siege is continued sufficiently long, the cells give way and the infectious host penetrates the epithelial barrier and enters the deeper tissues of the tonsil and body.

The Sinus Tonsillaris.—The anterior pillar contains the palato-

glossus muscle and forms the anterior boundary, whereas the posterior pillar contains the palatopharyngeus muscle, and forms the posterior boundary of the sinus. The pillars meet above to unite with the soft palate. Inferiorly, they diverge and enter into the tissues at the base of the tongue and the lateral wall of the pharynx respectively. The outer wall of the sinus tonsillaris is composed of the superior constrictor muscle of the pharynx. The sinus tonsillaris is, therefore, a triangular depression on the lateral wall of the fauces which partially envelops the tonsil.

In so far as my clinical observations show, the tonsil is loosely attached to the sinus; that is, the so-called adhesions are not present. The extent of the attachment varies in different subjects. Paterson has shown that the supratonsillar fossa may extend downward so as to admit a bent probe between the outer side of the tonsil and the superior constrictor muscle of the pharynx, as far as the inner surface of the lower jaw. Even where the attachment is general, it is not usually so firm as to greatly interfere with the enucleation of the tonsil. The "adhesion" to the anterior pillar so often spoken of is, in my opinion, a myth. It is true that the tonsil has an anatomical connection with the anterior pillar, but the union is not of that firm fibrous nature usually implied by the term. Indeed, the adhesion often undoubtedly refers to the presence of the plicatriangularis, which covers the antero-inferior portion of the tonsil, and which is often attached to the tonsil at its inferior extremity. One writer even speaks of the plicatriangularis as an hypertrophy of the anterior pillar, whereas in fact it is an embryological structure which in some of the lower animals develops into tonsil itself.

The anterior limit of the sinus tonsillaris often extends well under the anterior pillar, thus concealing a large portion of the tonsil. The outline of the tonsil may readily be determined by physical examination, or by seizing it with forceps and drawing it towards the median line of the throat. When thus drawn, the anterior shoulder of the tonsil may be seen outlined beneath the anterior pillar, and if still more forcibly drawn inward the tonsil mass slips from beneath the pillar, thus showing that it is not markedly adherent, but that, on the contrary, it is loosely attached and by proper procedure may be readily enucleated.

The Lymphatics.—The relation of the tonsil to the lymphatic

vessels is somewhat different from that existing between a lymphatic gland and vessels. The difference consists in the fact that the lymphatic vessels have their origin in the tonsil, whereas they pass through the lymphatic gland. The question of chief clinical importance is the course and termination of the tonsillar lymphatic vessels which drain into the deep cervical chain underneath the sternocleido-mastoid muscle, and from thence to the thoracic glands, and finally into the thoracic duct. By this route infection is carried to all parts of the body. The tonsil under certain conditions is peculiarly susceptible to infection, and becomes, therefore, the atrium of infection for a greater variety of diseases extraneous to itself. The literature is rich with clinical reports of diseases illustrating this fact. In reference to the tonsil as a portal of infection in tuberculous processes, it is pretty generally admitted that it often takes place through the tonsil and extends from thence through the lymphatics of the deep cervical chain on into the thorax. It then passes through the hilus of the lung into the visceral pulmonary lymphatics. The apex of the right lung is the most frequent seat for the inception of the pulmonary tuberculosis. This has heretofore been attributed to the fact that this area is less directly in line with the respiratory air current, and that this portion of the lung has less motion than other portions of either lung. It forms, therefore, a peculiarly favorable location for the development of the tubercle bacillus.

Dr. J. Grober has called this route of pulmonary infection into question, or, at least, he has set up a rival hypothetical explanation, based upon a series of experiments upon lower animals. He reports the following three suggestive experiments out of a total of twenty-eight:

First experiment, September 16, 1902. A young rabbit was anesthetized by ether and chloroform, and one cubic centimeter of a sterilized emulsion of black Chinese paint injected into the left tonsil.

September 23, 1902, the autopsy showed black particles in the blood. Behind the left tonsil there was a mass composed of the coloring matter and leucocytes. The lymph glands on the left side of the neck, as far as the upper border of the thyroid cartilage, were stained black. The microscope demonstrated the lymph vessels filled with free coloring matter, as well as leuco-

cytes, which enclosed small particles of pigment. The glands and lymph vessels were packed with the coloring matter. Beyond the zone of the lymph glands and vessels little coloring matter was found.

Second experiment. A small dog was narcotized by morphine injections; six and a half c.c. of the sterilized emulsion of black pigment was injected into the tonsil.

The autopsy, after complete exsanguination, showed the following conditions: Very little coloring matter in the leucocytes, none being free in the blood. The tonsil and the loose connective tissue containing the afferent lymphatic vessels of the tonsil were of a deep black color. Along the muscles of the neck, as far as the hyoid bone, and to the median line, there were streaks of pigment. The pigmented area also spread downward below the hyoid bone, where it extended one centimeter beyond the median line. The coloring matter was traced to the bony opening of the thorax, and to the parietal pleura, which, when stripped off and examined by transmitted light, showed the black pigmentation. The lymph vessels of the paratracheal connective tissue and of the esophagus, as far as two or three centimeters above the bifurcation of the trachea, were also colored; whereas on the left or uninjected side no such phenomenon was found. All the lymph glands on the lateral wall of the pharynx, hyoid bone, larynx, along the deep vessels of the neck and supraclavicular fossa on the right side, were black. The parietal pleura at the apex showed an exudate, but no adhesion to the visceral pleura.

The microscope showed that in all the above-mentioned positions there were no other changes present. In the glands the coloring matter occupied the paravascular spaces. In the lymph vessels between the supraclavicular glands and the parietal pleura of the apex, there were a large number of leucocytes filled with coloring matter. Free coloring matter was also present in this region. In the apex of the lung there were no signs of an inflammatory reaction. The coloring matter here seemed to be freely deposited within the connective tissue. In the above-mentioned exudate at the apex there was coloring matter in the leucocytes.

Third experiment, April 2, 1903. A small dog was placed under morphine narcosis and five c.c. of coloring matter injected into the tonsil. April 13th the same experiment was performed on the opposite side.

May 10th the autopsy, after exsanguination, showed a large amount of coloring matter free in the blood, the leucocytes, the tonsil and connective tissue, and the connective tissue of the neck on both sides along the larynx to the aperture of the thorax was colored symmetrically. The lymphatic chains along the large blood vessels, as well as those in the supraclavicular region, were deeply stained. The coloring matter was also found within the

lymphatic vessel and in the paravascular spaces. A fibrous exudate was found at the apices of both lungs, thus forming a bridge of inflammatory material from the parietal to the visceral pleura. The coloring matter was also present in the exudate. The microscopic appearance of the apices presented a light grayish coloration. The glands of the mediastinum were stained on the left side, as were also the bronchial glands. In the left lung there were three other small fibrinous exudates in which the coloring matter was present.

From these experiments Grober builds the hypothesis that tuberculous infection of the apex of the lung may take place via the deep lymphatic chain, the supraclavicular glands, and thence to the parietal lymphatic vessels, where an inflammatory exudate is thrown across to the visceral pleura of the lung. The tubercle bacilli travel across this inflammatory bridge and enter the apex of the lung.

While these experiments are not conclusive, they are interesting and open a field for further observations.

The Blood Supply.—The tonsillar artery, a branch of the facial, is the chief vessel to the tonsil, though the ascending palatine, another branch of the lingual, sometimes takes its place. The tonsillar artery passes upward on the outer side of the superior constrictor muscle, through which it passes and gives off branches of the tonsil and soft palate. The palatine, another branch of the lingual, also sends branches through the superior constrictor muscle to the tonsil. The ascending pharyngeal also passes upward outside of the superior constrictor, and, when the ascending palatine artery is small, it gives off a tonsillar branch which is correspondingly larger. The dorsalis linguæ, a branch of the lingual artery, ascends to the base of the tongue, and sends branches to the tonsil and pillars of the fauces. The descending or posterior palatine artery, a branch of the internal maxillary, supplies the tonsil and soft palate from above, forming anastomoses with the ascending palatine. The small meningeal artery sends some branches to the tonsil, though they are of minor importance.

The Clinical Application of the Foregoing Data.—Without reviewing the literature, which is rich in reports of cases, showing the tonsil to be the portal of infection for many diseases in remote parts of the body, I have attempted to show under what conditions

it becomes the portal or atrium of infection. Under conditions of local equilibrium or health of the epithelium lining the tonsillar crypts, infection does not take place; whereas, when the local equilibrium is lost, infection occurs. That the local equilibrium of the cryptic epithelium is frequently lost is apparent to every clinician. In addition to the diseases arising through the tonsil as a portal of infection, there are those limited to or having their focal center in the tonsil itself. Perhaps the strongest indictment against the tonsil is that it is often the atrium of infection in pulmonary tuberculosis. Whether the route of infection is via the deep lymphatics and the hilus of the lung, or the deep lymphatics and the parietal pleura at the apex, as shown by analogy in the experiments of Grober, is immaterial in so far as the general question is concerned. The question of prime importance is: Do pulmonary or any other types of tuberculosis have their origin through the tonsil as a portal of infection? In view of my own clinical observation, and of others more competent, I must answer in the affirmative. Just what percentage has not been fully determined. Various writers report 4 to 10 per cent. of tonsils removed as showing local tubercular lesions, as the presence of tubercle bacilli and giant cells. The anatomical structures of the tonsil which seem to favor infections are the deep crypts, and especially those in the supratonsillar fossa and those covered by the plicatriangularis. Wright has suggested that the imperfect drainage of the crypts leads to the ultimate loss of tonicity (equilibrium) in the epithelial cells lining the crypts, thereby opening the way to systemic infection through the tonsil.

The question naturally presented at this juncture is: What is the rational method of procedure to protect the system from further infection? The choice of remedial measures seems to lie between internal medication, local applications, and surgical interference.

As to the first and second methods of treatment, it may be said that there are cases which may be satisfactorily treated by them, especially in relieving the distressing local inflammatory symptoms. Indeed, many cases may be practically cured by such treatment. There are many others, however, in which such measures are wholly inadequate, either to relieve immediate

symptoms or to ward off future attacks. In these cases we have usually resorted to some surgical procedure, such as opening the crypts, plunging the cautery point obliquely across them, decapitation (partial removal of the tonsil), and the complete removal of the tonsil.

The literature shows a wide divergence of opinion as to what constitutes the best method of surgical treatment, though it shows nearly all writers are practically agreed that some sort of surgical procedure is indicated.

What does the anatomy seem to indicate? It shows certain crypts so situated as to afford poor drainage of their contents. This is especially true of those discharging into the supratonsillar fossa. Killian has suggested that the supratonsillar crypts be opened with a sharp knife, and that the incised surface be painted with a 5 to 20 per cent. trichloracetic acid. By thus opening the crypts their contents are drained. The acid applications excite a violent inflammatory reaction which results in the contraction of the tonsillar tissue. The process is often an extremely painful one, and may result in cellulitis and scar tissue. Furthermore, it does not always prevent further infection through the tonsil. It is, therefore, often necessary to repeat the incision and acid applications.

The patient is entitled to immunity from tonsillar infection if it can be established without seriously jeopardizing either his health or life. When the tonsil becomes a well-established atrium of infection, the physical economy of the patient is constantly menaced by conditions ranging all the way from a follicular tonsillitis to endocarditis and pulmonary tuberculosis. Measures should, therefore, be adopted which will insure future freedom from infection through the tonsil.

It has been shown by abundant clinical experience that cauterization of the lumen of the crypts, or obliquely across them into the surrounding follicular tissue, does not adequately meet the indications. The same is true of "decapitation," or partial removal of the tonsil. Decapitation leaves the deep more diseased portion of the crypts, and while it may afford some relief, it is often followed by recurrent infections and by the reformation of the tonsillar tissue.

The complete removal of the tonsil with its capsule intact is, as

far as I know, the only mode of surgical procedure that guarantees immunity from infection through the sinus tonsillaris.

The function of the tonsil and the effect of its complete removal upon the general condition of the patient must be considered; so also must the question of hemorrhage. In reference to the effect of the removal of the tonsil upon the general system, it may be said that there is little evidence that it has any deleterious result. Masini, however, believes that the tonsil has an internal secretion comparable with that given off by the suprarenal gland. He arrived at this conclusion after experiments with the aqueous extract of the tonsil, intravenous injections of which gave the same results obtained from the injection of suprarenal extract.

The last word concerning the treatment of the tonsil cannot be spoken until its exact function is established. Clinically, there is little to show evil effects from its removal, whereas there is much evidence to show the good resulting from it, and especially its complete removal. I have attempted its complete removal with the capsule intact in about four hundred tonsils during the past four years, and, barring one or two instances in which there was a temporary paresis of the palatopharyngeus muscle, and a half dozen moderate hemorrhages, I have seen no untoward result. The general health of many was greatly improved, and recurrent septic inflammation within the sinus tonsillaris has been eliminated. Recurrence of the tonsillar tissue has not taken place in a single instance. The fact of its regrowth is almost prima facie evidence that the entire tonsil was not removed. I will not attempt to deny that follicular tissue can be removed from the sinus tonsillaris after the complete removal of the tonsil, and that follicular tissue may develop within the sinus tonsillaris subsequent to the removal of the tonsil. But this should not be mistaken for the recurrence of the tonsil. *The tonsil is an encapsulated mass of lymphoid tissue characterized by numerous crypts.*

Having removed the entire tonsil with its fibrous envelope and its crypts, the chief source of infection is removed. It is, of course, possible for the follicular tissue which surrounds the tonsil to become diseased, but this should be differentiated from tonsillar disease. When the tonsil is not removed with its capsule intact, it is, of course, impossible to determine whether it has been en-

tirely removed; and if a part of it is left regeneration might well take place. With these facts in mind, it is apparent that the complete removal of the tonsil should show a distinctly defined mass of lymphoid tissue enveloped within a fibrous capsule on its outer, and with mucous membrane on its inner, aspect. Lymphoid tissue which is not thus characterized is not tonsil tissue.

Hemorrhage.—The danger from hemorrhage is, perhaps, the greatest "bugbear" of the operation. Is this a real or an imaginary obstacle? It is both. It is real in so far as severe hemorrhage does occasionally occur in tonsil operations. It is imaginary in so far as the reputed frequency of its occurrence, and the degree of the danger attending it, are concerned. A clear knowledge of the possible sources of hemorrhage will enable the operator to largely exclude its occurrence. Furthermore, there are certain matters in the technique of local anesthesia, and in the after-treatment, which, if properly applied, will greatly reduce the frequency and amount of hemorrhage. Clinically, I have observed that the most frequent site of arterial hemorrhage is at about the middle portion of the sinus tonsillaris, where the tonsillar branch of the facial pierces the superior constrictor muscle of the pharynx. Other points of hemorrhage are usually limited to the inferior portion of the sinus tonsillaris, where the tonsillar venous plexus is located, and to the anterior and posterior pillars.

In another part of this paper I have referred to the fact that three arteries, the tonsillar, the ascending palatine, and the ascending pharyngeal, pass upward on the outside of the superior constrictor muscle, which they pierce as they turn inward to ramify the tonsil and faucial pillars. Just before entering the tonsil they break up into several branches. It is obvious that the smaller the branches cut during an operation, the less serious the hemorrhage. The clinical application of this fact is that if the arterial branches are severed as they enter the capsule of the tonsil, the liability to hemorrhage is reduced to the minimum; whereas, if they are severed on the outer aspect of the superior constrictor muscle, before they are broken up into smaller branches, the danger from both primary and secondary hemorrhage is greatly increased. It may be said that the operator should not injure the

superior constrictor muscle in this operation, and this is true. Indeed, if he thoroughly appreciates the clinical significance of the anatomy of the tonsillar region, he probably will not injure it. There's the rub.

As to the anterior pillar, it should be borne in mind that there are arterial twigs coursing upward through it. The main trunks of the arterial branches are external to the palatoglossus muscle. Hence it follows that, in order to injure them, it is necessary either to pass the instrument behind the muscle and thus injure them, or to include the musculature of the anterior pillar in the grasp of the tonsillotome, knives, blunt dissectors, scissors, etc., and thus sever the muscle and vessels of the anterior pillar. The same statements may be made in reference to the posterior pillar.

The technique should, therefore, be such as to avoid injury of the muscles bounding the sinus tonsillaris, namely, the superior constrictor of the pharynx, the palatoglossus, and the palatopharyngeus muscles, as by so doing the larger trunks of the tonsillar arteries are injured.

The technique of the complete enucleation of the tonsil with its capsule intact is shown in the following illustrations:

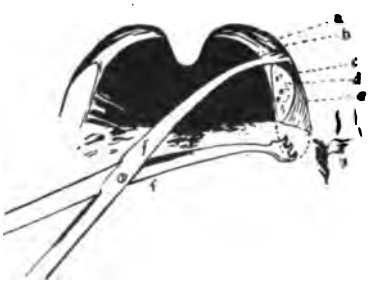


Fig. 1. (a.) The soft palate above the supratonsillar space. The margin of mucous membrane arching over the median boundary of the supratonsillar fossa is known as the margosupratonsillaris. (b.) One prong of the forceps is introduced into the supratonsillar fossa. The other prong tip is inserted at the inferior portion of the tonsil. While in this position they are forced outward and closed as shown in Fig. 2. (c.) The upper attachment of the plicatonsillaris is to the posterior margin of the anterior

pillar, though its attachment is often in the recess posterior to the pillar. (d.) The tonsil partially covered by the plicatriangularis. (e.) The plicatonsillaris.

Fig. 2. Showing the tonsil forceps closed on the tonsil after the manner described in Fig. 1. When thus grasped traction should be made in an inward and forward direction to lift the tonsil from the sinus tonsillaris and away from the internal carotid artery. The internal carotid artery is approximately one inch posterior and external to the tonsil, or at the posterior angle of the pterygoid space, which is filled with fatty tissue. This tissue in the living subject is semi-liquid, hence in pulling the tonsil inward and forward it is dragged away from the artery (Wilson). While the danger of injuring the carotid artery is a remote one, this method of procedure renders it still more remote. The practice of having an assistant make external pressure under the angle of the jaw forces the carotid nearer the tonsil and increases the danger of cutting it.

Fig. 3. Showing the tonsil separated from the anterior and posterior pillars. The incision should be made from below upward at the junction of the anterior pillar and the plicatonsillaris, thence arching over the margosupratonsillaris, thence downward along the anterior attachment of the posterior pillar to the tonsil. The incision when complete is in the form of a horseshoe or an inverted U. The incision should be carried through the mucous membrane and the loose connective tissue beneath it. The tonsil then falls inward and reveals the cavity of the sinus tonsillaris, to which the tonsil is usually but loosely attached. While making the incision the tonsil should be rather forcibly drawn forward and inward so as to put the tissues upon the stretch and to pull the anterior portion of the tonsil from beneath the anterior pillar. It should be remembered that almost a third of the tonsil is often located beneath or to the outer aspect of this pillar. It is but loosely attached to this pillar, as may

be seen by traction on the tonsil, during which it slips from beneath it without dragging the pillar with it. The slight attachment of the tonsil to the sinus tonsillaris is readily demonstrated if care is exercised to avoid cutting its capsule in making the ∩-shaped incision through the mucosa and the underlying loose connective tissue. The instrument for making the incision may be the Kyle right-angled tonsil knife or a short-bladed straight bistoury (see Figs. 9-11). I have often used Kyle's knife, though in my most recent operations I have used the straight bistoury with great satisfaction.

Fig. 4. Showing the tonsil partially dissected from its sinus. The tonsil forceps is shown grasping the tonsil, the upper prong tip being inserted deep into the wound. Traction should be made again in a forward and inward direction and the dissection continued in a downward direction, just external to the capsule of the tonsil. The capsule should not be cut at any stage of the operation, as to do so allows the substance of the tonsil to bulge into the wound, thereby materially interfering with the proper performance of the operation. The capsule should remain intact, so that when the tonsil is removed its outer aspect presents a smooth membranous surface.

Fig. 5. Schema showing the tonsillar artery passing upward on the outer aspect of the superior constrictor muscle (MM), thence through it, subdividing as it does so, thence into the tonsil (TT), where it still further subdivides into smaller branches. It is apparent that, if in dissecting the tonsil from the sinus tonsillaris the thickness of the superior constrictor

muscle is included with the tonsil, the artery will be severed in its main stem; whereas, if the incision hugs the outer aspect of the tonsil closely only the smaller twigs will be cut through. The bleeding in the first instance will be more profuse than in the second, as the lumen of the vessel is much larger. Hence the importance of hugging the capsule closely during the dissection. The same rule applies to nearly all the arteries suppliying the tonsil and the sinus tonsillaris; i. e., if the capsule is closely followed in the dissection the liability of severe hemorrhage is lessened.

Fig. 6. Showing the tonsil, with its capsule intact, dissected from the sinus except at its inferior portion. The dissection may be completed with the right-angled knife or with a bistoury, though I usually use the ecraseur, shown in this illustration and in Fig. 9. The advantage attending the use of the ecraseur at this stage is the speed with which the operation can be completed. Furthermore, I have found that it hugs the tonsil without injuring the capsule. The ecraseur should be placed over the tonsil forceps before it seizes the tonsil, as it cannot be made to do so afterward for obvious reasons.

Fig. 7. Showing the ecraseur with the tonsil pulled through its ring blade ready for final severance, which is done by approximating the handles of the instrument. (Fig. 9.)

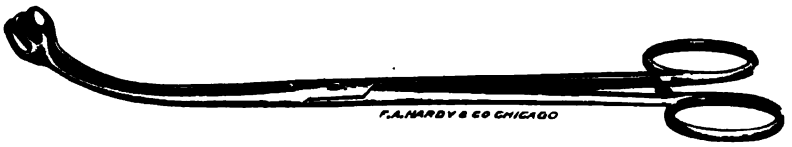


Fig. 8. The author's tonsil forceps, with or without catch. The forceps is designed to seize the tonsil in its perpendicular or upright axis, one tip being placed in the supratonsillar fossa, the other at the inferior portion of the tonsil. (Fig. 1.) They are not designed to seize the tonsil anteroposteriorly or superficially. A deep grasp is always contemplated; indeed, the fibrous capsule on the outer or hidden aspect of the tonsil should be engaged with the forceps before attempting to dissect the tonsil.

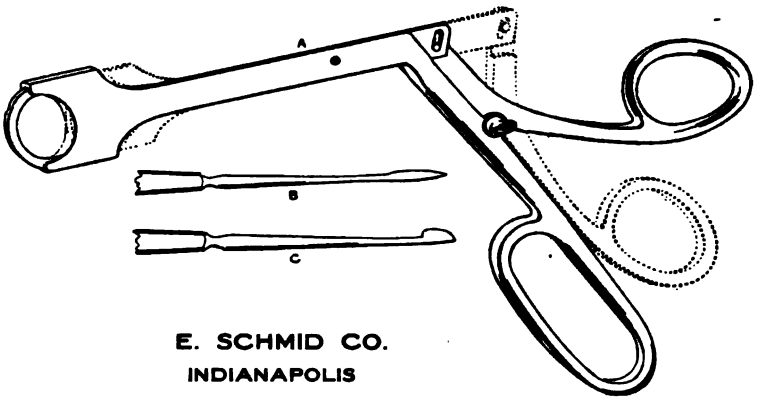


Fig 9. The upper figure is the author's ecraseur-tonsillotome. This instrument was designed to replace the tonsil snare. The ring blade is dull, like the round surface of a heavy wire, and severs the tissue without the clean cut of a sharp blade. If there are any advantages in a dull or wire-snare instrument this ecraseur possesses them. In addition, it is always ready for use without the necessity of adjusting a wire. Its use is as simple as the Mathieu tonsillotome. It is also provided with a sharp blade if it is desired to use it as a tonsillotome. The two lower figures are the author's tonsil knives; the narrow-bladed one being used to make the Π-shaped incision, while the broad-bladed one is used to complete the dissection.

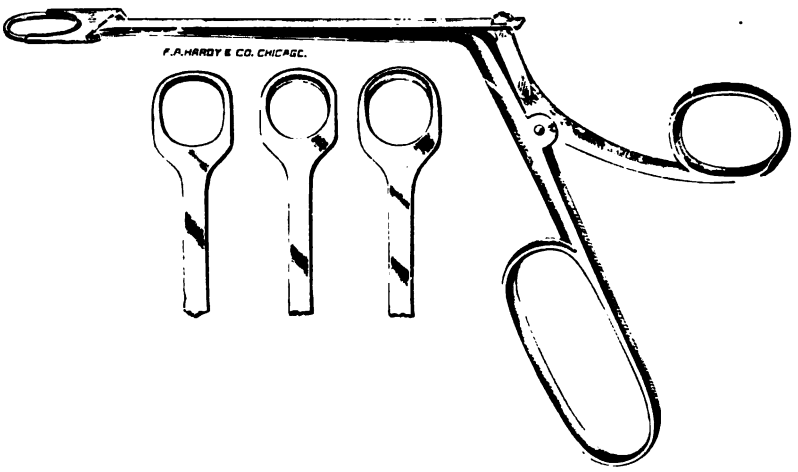


Fig. 10. Another model of the author's ecraseur-tonsillotome, in which the ring blade is horizontal when the handles of the instrument are perpendicular. Some prefer this model to the upright blade, as it affords more power in engaging the partially dissected tonsil in the ring blade.

Fig. 11. Kyle's right-angled tonsil knife, with which the entire dissection may be made.

MOUTH BREATHING.

BY WILLIAM LINCOLN, M.D.

MEYER, in his classical description of lymphoid hypertrophies in the postnasal space, insisted particularly on the diagnostic value of that facial peculiarity which has since generally been spoken of as the "facies adenoidalis," implying that this peculiar facial distortion could be considered pathognomonic of the presence of adenoid vegetations in the throat or that it arose solely as a result of their presence. Since Meyer's article appeared, most authors have followed his description, and the bulging lips, open mouth, and vacant stare have become the face of adenoids irrespective of any other cause which might aid in giving rise to it. This picture is of so common occurrence that it needs no description here. Along with this facial conformation it has been noted, in nearly all cases, that the patient, besides having other symptoms, is a mouth breather, either occasional or habitual, and the natural conclusion drawn has been that, as the adenoids were the causative factor in this mouth breathing, by blocking more or less completely the space between the nose and throat, their removal should of necessity be all that was needed to correct this pernicious habit and relieve all the symptoms which depended upon it. In many cases this was found to be true, but in a large proportion of mouth breathers when the nasopharynx has been cleaned of the offending masses no such relief has resulted, and this has been so particularly in the most pronounced cases, where the mouth breathing was having its worst effects. This has led to disappointment to many operators and patients alike, and various ingenious means and appliances have been tried in order to force a better result. Repeated operations in the nasopharnx; very thorough removal of intranasal tissues by knife, saw, and cautery; the application and wearing of various more or less complicated harness to force the lower maxilla into its place—all of these measures have met with only limited success in making the pronounced mouth breather an habitual nose breather. A careful study of my own experience

with these cases and close observation of the contour and position of all the facial structures in mouth breathers have made it apparent to me that, as a general rule, these patients have suffered so great distortion of the osseous framework of the face, particularly of the lower and upper maxillæ and their arches, that no amount of removal of adenoid vegetations or intranasal tissues will alone suffice to relieve them of mouth breathing, but such measures must be supplemented by, as nearly as possible, restoring these osseous parts to their normal position and correlation. In a recent paper before the British Medical Association, Bogue reports that he has examined many aboriginal skulls and found that in all cases when irregularities in the development and position of the upper teeth exist there are also irregularities more or less strongly marked in the development of the maxillæ and the palate bones, and seemingly in the vomer, the sphenoid, and the ethmoid as well, and that the nasal septum particularly is sure to be crooked and the turbinal bones so excessively curved as to materially interfere with the proper openings of the nasal meatus. He further reports a number of cases in which mouth breathing as well as other symptoms have been relieved by patient and thorough work done to bring about better coaptation of the dental surfaces and correction of deformities of the maxillæ. In a number of cases I have observed work of a similar character, which has been done by capable and careful dental surgeons, following thorough cleaning out of hypertrophied lymphoid structures, and have been gratified to observe total and permanent cures of mouth breathing. Under normal conditions the teeth and lips are held in correct apposition by the normal tonicity of the facial and buccal muscles, principally the buccinators, the masseters, the temporals and the orbicularis. When, however, these muscles are, to some slight extent, weakened by altered bone conformation the jaws are brought and held together by them only by conscious effort. During sleep, and when the patient is inattentive, the jaws assume their incorrect apposition or drop apart, and the lips cannot cover the teeth and close as they should without effort. In some cases, as you will notice in the pictures I will show, there arises a condition in which the posterior molars come together in such manner as to render it impossible for the incisors to be brought together at all, locking the jaws, as it were, in an open position. The determination of

cause and effect in the study of these cases of deformity of the facial bones and lymphoid hypertrophies is not easy. It is certain that either condition is provocative of the other. Enlarged pharyngeal and faucial tonsils will, by their disturbing presence, so weaken the growing child that not only is dentition delayed

Case I.

and decay of the teeth started, but the whole bony framework of the face, and indeed of the whole body, is retarded in growth and weakened in texture. Locally it seems probable that if the masses of hypertrophied tonsils and adenoids are large they may, by slight but constant pressure, change to some extent the

correct relation of the upper and lower maxillæ. On the other hand, the normal width and shape of the maxillary arches being disturbed, there must follow septal deformities, turbinal distortion and enlargement and, as a consequence, encroachment on the lumen of the nostrils, rendering nasal breathing impossible or

Case I—Front.

very difficult, whereby in turn the nasopharynx suffers and adenoids ensue.

Thus, in a vicious circle, these troubles react on each other and perfect relief is to be expected only as a result of correction of not one but all of the causative factors.

I wish in a few minutes to show a few lantern pictures which

will describe, better than words, the conditions of some of these cases and the results attained by treatment. I am indebted to Dr. Casto, of Cleveland, for these slides.

The results in these cases and in many others which I have observed have been very convincing to my mind that in a large proportion of our cases who have suffered for any length of time from enlarged faucial and pharyngeal tonsils and mouth breath-

Case I—Side.

ing, in order to secure and maintain a permanent good result, the assistance of skillful and patient work of this character will be necessary.

CASE I.—Shows a girl of 14 with undeveloped lower maxillæ and marked distortion of the arches, in whom adenoids and hypertrophied tonsils had been removed with no relief of the mouth breathing, for reasons shown by the pictures of the teeth.

One year later the picture shows the girl with much improved facial expression, with mouth breathing cured and the dental surfaces in proper apposition.

CASE II.—A girl of 16, in whom no alleviation of mouth breathing was secured by removal of adenoids and tonsils. The

Case II.

picture of the teeth shows that when the posterior molars came in apposition they locked in an improper position, and it was impossible to bring the incisors together or to close the lips over them without considerable muscular effort. The correction of this condition is shown very well in the lower picture.

(The other pictures shown by lantern when this paper was read

serve only to illustrate different degrees of the same condition and so are not reproduced here).

Discussion.

DR. H. L. SWAIN.—I would like to inquire how long it takes to do this work if the doctor will tell us about it. It is a matter of months, sometimes more than a year, in the cases that we have

Case II.

seen down in my part of the country, and yet the results as you have seen depicted here are so notoriously for the benefit of the patient in every way. Not merely in looks, but how much better for mastication it must be to have your teeth come together, and not as in that exaggerated case that we have seen in plaster. I think it is one of the most remarkable demonstrations of the pliability of dental arch dentistry that such defects as this can be brought around to something approximately normal, and if on the

one hand they can do that, on the other hand we can easily see how these gross changes are brought about by defects in respiratory passages. Yet when all is said it is not always the adenoid or the tonsil that produces these defects. Any inherited defect, of course, would be exaggerated if mouth breathing persists, the nose having been shut off by some pathological condition.

DR. J. W. GLEITSMANN.—There have been a great many papers written of older and more recent dates, but so far the authors do not agree as to whether the adenoids and tonsils have an effect on the formation of the hard palate or not.

DR. LINCOLN.—I have nothing further to add, not claiming special knowledge about this work. As Dr. Swain says, the cases take a long time to effect these cures. As to which may be considered absolutely the causative factor in the cases of mouth breathing, I have already said it is almost impossible to determine. Sometimes we think that the distortion is caused by adenoid growths, and at another time it is quite certain that adenoid growths and other unhealthy structures are caused by inherited malformation.

THE REMOVAL OF ADENOID VEGETATIONS THROUGH THE NASAL PASSAGES BY A NEW METHOD.

BY OTTO T. FREER, M.D.

THE adenoid curette or ringknife in its many forms is at the present time so widely used for the removal of adenoid vegetations that its employment is understood as a matter of course by most authors when the operation is alluded to. Its popularity is not a proof of the perfect fitness of this implement for its purpose, however, for the wish to complete all surgical procedures with the least expenditure of time and effort is apt to make those methods and instruments the favorites that hasten the performance of an operation and make it as nearly mechanical as possible. For this reason devices with a nearly automatic action, which replaces as much as it can the performance of instruments representing extensions of the intelligently acting fingers and hand, have always proved alluring because they are designed to perform with one sweep what would otherwise take time and trouble. The fault of these mechanical inventions, however, is their lack of adaptability to the varying conditions, both anatomical and pathological, apt to be encountered, for while they fit more or less well a certain form of an affection which their designer had in mind when he fashioned them, they apply themselves poorly or not at all to variations differing even moderately from it in structure or surroundings. An example of this kind of device is the popular tonsillotome, which with approximate exactness removes the small class of superficially projecting tonsils which represented typical tonsillar hypertrophy and its anatomical relations to its inventors, but is an instrument not at all adapted to the much larger genus of partly or wholly submerged enlargements of the tonsil buried between the pillars of the fauces. The form and mode of action of the ringknife are evidence that its designers had in mind the tonsillotome in constructing it and with the tonsillotome it shares the fault of a mechanically acting instrument fitted for but one

type of a condition presenting widely differing varieties. The same conception that led to the creation of the tonsillotome, that the tonsil to be removed was always well defined and prominent, seems to have guided the designers of the ringknife, who evidently had a preconceived idea that the type of enlarged pharyngeal tonsil usually encountered forms a circumscribed mass projecting like a faucial tonsil from the vault of the pharynx. An adenoid growth of this kind is of course well designed to be planed off with the ringknife, but in my experience this variety is much rarer than proliferations of lymphoid tissue of more extensive and diffuse origin which not only hang from the pharyngeal vault but occupy the posterior wall of the pharynx, both the recessus pharyngeus and often the posterior portions of the nasal fossæ in front of the choanal openings. The ringknife could cut away the central portion of such a collection of adenoid vegetations while unable to reach the growths on the posterior wall, in the recessus and choanæ. Chiari (*Krankheiten der Oberen Luftwege*, vol. 2, p. 119, 1903) states that often vegetations low down on the posterior wall of the nasopharynx and always those in the recessus pharyngeus escape the ringknife, and Johann Fein (*Wiener med. Wochenschrift*, No. 45, p. 2152, 1905), himself an advocate of the principle of the ringknife, says that it cannot reach adenoid growths in the fossa of Rosenmueller (recessus pharyngeus) or those attached to the upper boundary of the cnoanæ in the domain of the nasal cavity. But even where the adenoid vegetations do not grow in the posterior nares, and their attachment begins just behind the septum, the ringknife may fail to reach them because the advancing blunt edge of the blade pushes the foremost fringe of the growth forward into the posterior nasal openings. Max Goerke (Fraenkel's *Archiv. fuer Laryngologie*, 1902, p. 278) says: "In using the curette a portion of the soft adenoid tissue that is wedged in between the instrument and the border of the choanæ is pressed into them and gradually expands again afterwards." In addition, the pendulous masses of lymphoid tissue so frequently found hanging from the pharyngeal vault and which slip aside so readily may avoid the ringknife or be incompletely divided by it, so that they remain attached to a pedicle in the nasopharynx. This condition is described by Chiari (loc. cit.).

The ringknife possesses another fault which makes it possible for portions of an adenoid growth to escape removal by it. Its

blade does not cut in the manner of a knife by slicing, as it is drawn through the tissues, but its edge impinges squarely against the material to be removed, with no slicing motion, so that there is a tendency to scrape over the adenoid masses rather than to cut them off, especially when they are freely movable and the vault of the pharynx is concave laterally so that the edge of the knife does not fit flatly against it.

Fein (loc. cit.) describes still another condition that makes a complete removal of the adenoid vegetations with the ringknife uncertain, and that is the limitation of the motions of the handle by the incisor teeth of the lower jaw below and the incisor teeth of the upper jaw and hard and soft palate above. The impinging of the handle on the lower incisors limits the motion of the blade forward, so that in cases where the jaws cannot be opened very widely it fails to reach the anterior part of the adenoid growth, and, as Fein states, the incisor teeth of children have been broken out in the violent attempt to include the foremost vegetations in the sweep of the knife. A long hard palate, aided by a rigid soft palate, also limits the forward reach of the blade, while its backward sweep is interfered with by the incisors of the upper jaw. Curving the stem to permit a good forward reach of the blade interferes with its backward excursion by reason of contact with the upper incisors, so that the straight stem is the best. Fein thinks that he has overcome these obstacles by the bayonet-shaped handle of his curette which carries the shank out of one corner of the mouth. Chiari, however, does not find that he can always operate radically with Fein's instrument, and the bayonet handle adds another bend to an instrument whose motions are already complicated by too many.

A certain type of adenoid growth often encountered by me is also unfavorable for the ringknife. I refer to the tough, firm, fibrous enlargement of the pharyngeal tonsil found in some children and often in adolescents and young adults. The blade is apt to slide over such masses without cutting away more than a small portion of them.

These reasons suffice to show that the ringknife is uncertain in its action, as is admitted by its advocates. It may completely remove the enlarged pharyngeal tonsil in suitable cases. In others it will cut away enough to produce improvement, so that the child breathes better than before the operation, but still has to

be urged to close his mouth, and this persistence of mouth breathing is then spoken of as a "habit." In a number of cases, however, the action of the knife is so superficial that the adenoid growth promptly reforms after its use and the child is as badly off as before. The tendency to a more or less complete reproduction of adenoid tissue from its vestiges after operation is described by Max Goerke, who refers to the extraordinary power of regeneration possessed by lymphatic tissue, and says that the remains of adenoid growths may increase in size by exuberant granulation from the cut surfaces until the dimensions of the original vegetations are reached, and that even after a thorough operation by the ringknife, exposing in places the basilar fibrocartilage, portions of lymphatic tissue remain embedded in the median line which escape the knife and become the source of regeneration of the adenoid vegetations.

The median portion of the growth is especially apt to be thus superficially removed where the pharyngeal vault is concave in the center, as it often is, the ringknife not being able to enter such or other depressions, as its shape fits it only for a level planing off of the hyperplastic tissue. Postnasal inspection in cases of this kind shows a deeply hollowed center in the pharyngeal tonsil in the region called the recessus pharyngeus medius by Disse (Heymann's "Handbuch der Laryngologie," vol. 2, p. 24), which would be superficially if at all reached by the blade of the ringknife. It has been my experience and that of others to meet a good many patients whose adenoid vegetations have been completely reproduced after a currettement with this instrument. Fein says that even men of skill who have performed the operation thousands of times with it from time to time fail to obtain a result. One failure, however, neutralizes the benefit to the operator's reputation of a number of successful operations, and the numerous relapses following the use of the ringknife have brought adenoid operations in general somewhat into discredit with the public.

In order to be sure of freedom from these annoying returns of adenoid vegetations it is necessary to radically extirpate them and any method that will accomplish this, even if it be more tedious than that of the ringknife, is to be preferred to it. As rivals to the ringknife postnasal forceps have always held their own, though overshadowed by it, and they are certainly capable

of a deeper and more thorough removal of the growths, as they are able to follow the adenoid tissue into hollow places and thus to clear it out of the highest portion of a funnel-shaped pharyngeal vault which would escape the level planing of the ringknife. The postnasal forceps shares, however, with the latter the difficulty of operating with an instrument with confusing curves that make complicated muscular movements necessary. While with the ringknife the sense of direction of the surgeon is the only guide for the instrument operating hidden in the nasopharynx, and for this reason it has occasionally wounded the tubal prominences, the motions of the postnasal forceps are to a certain extent under the control of the index finger inserted behind the soft palate, the sense of touch indicating to the beak of the instrument the location of the separate growths. Unfortunately there is but little room in the nasopharynx for both finger and forceps, and for this reason I have usually found it necessary to withdraw my finger partly before seizing the desired growth, so that a certain amount of uncertain groping for the vegetations also belongs to the postnasal forceps. On account of this lack of the exact knowledge of the whereabouts of the jaws of the instrument I have seen an operator break off a large fragment of the vomer with it, and I have known surgeons to introduce it many times before it could be made to seize a certain adenoid outgrowth. The postnasal forceps has the advantage over the ringknife that it can clear the fossa of Rosenmueller and also the posterior wall of the nasopharynx fairly well, but, as stated, its curves make it an awkward and somewhat uncertain tool, and by reason of its size and the lack of exact control of its motions it is not a suitable instrument for clearing the posterior ends of the nasal fossæ, which, just beyond the choanæ, are in my experience often filled with pendulous adenoid tissue.

As rivals to the forceps or ringknife the sharp spoons cannot come into question; movable masses avoid them, they cannot remove a tough fibrous growth, and, as Chiari states, they are apt in places to penetrate the tissues to a dangerous depth.

Besides the oral mode of access to the growths with its complicated curves there is the direct route through the nasal passages, first adopted by W. Meyer, but abandoned since by all operators for the roomier way through the mouth, as apparently instruments of sufficient size to remove the adenoid growths rapidly can-

not be passed through the nares. That this is only apparently the case I hope to be able to make clear in this paper. The advantage of the nasal route is its directness, so that a straight instrument without curves or angles to confuse the muscular sense can be passed through it and can therefore be easily guided with exactness. Another factor in favor of this mode of access to the nasopharynx is the ability to keep the index finger in the nasopharynx to control every step of the operation by the sense of touch and to push the adenoid vegetations towards the operating instrument. The one I employ is a forceps with smoothly rounded beak, designed originally by Ingals for the removal of bone

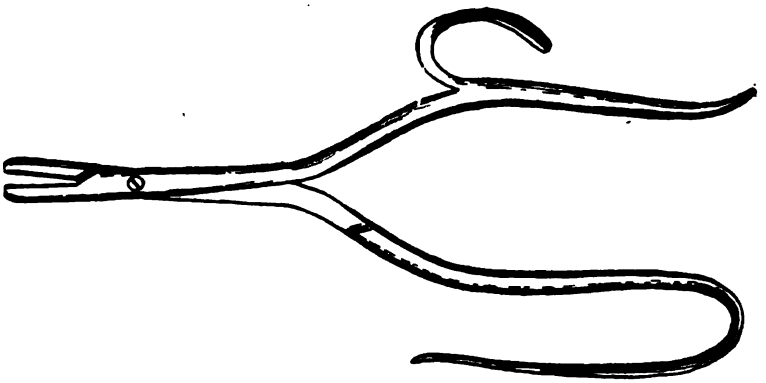


Fig. 1. The pernasal forceps for the removal of adenoid vegetations through the nasal passages. The instrument has a shears handle for easy opening and closing.

in the nose and called Ingals' nasal bone forceps. It proved so singularly suited to the adenoid operation that the original instrument answers excellently, and I have only modified it by arranging the handle so that it can readily be opened and shut. I also have a forceps with a slightly curved beak and one of smaller size than the original. The jaws of the instrument should have a soft temper, as if hardened too much they are apt to break off. The uncertainty as to whether I had removed all of the adenoid vegetations in using the postnasal forceps first induced me to finish the operation by cutting away such adenoid growths as were left behind by means of the pernasal forceps described passed through the nose, and as I grew more skillful with it I

began to use it for the whole operation and have done so for the past few years. At first sight the instrument seems too large to pass through a child's nares without force, but in practice I have never had material difficulty in introducing it through the nostrils of even very young children, the youngest one operated on in this way being but six months old. The reasons for the ready introduction of such a comparatively large instrument through the nasal fossæ of a child are the proportionately large heads of children, giving them relatively roomy nostrils; their broad faces, which are accompanied by correspondingly broad nares; the undeveloped state of their turbinated bodies and the elasticity of their growing nasal septa. The latter factor makes it possible to even insinuate the forceps past moderate cartilaginous or slight bony deflections of the septum. The little turbinated bodies of the child with their small amount of bony tissue are readily compressed against the outer wall of the nares.

The mode of operation is as follows: Chloroform anesthesia combined with local cocaine anesthesia is employed, the child being barely in half narcosis, while a good deal of reliance is placed on the local insensibility obtained by means of a small amount of a 10 per cent. spray of cocaine introduced into the nostrils when the child begins to go to sleep. When the narcosis is sufficient a gag is inserted, the child is placed on its left side with its left arm behind it, the head is thrown well back, the face is brought clear to the edge of the table and is slightly inclined downward so that the blood can run out of the mouth and nose, the position being one employed for many years by Ingals and others for all adenoid operations and recently exploited as a new method. The finger is then introduced into the nasopharynx, while the forceps, with its thin side looking towards the roof of the child's nose, is introduced through one of the nares, following the septum and nasal floor, very slight pressure being needed to make it pass through the posterior naris to reach the index finger in the pharynx. The forceps is then turned so that its broad side looks towards the vault of the pharynx and the jaws are widely opened while the index finger guides as much of the adenoid growth into them as they can hold; they are then firmly thrust into the base of the mass and with their cutting edges partly tear and partly cut it off. The forceps is then turned so that its thin side looks towards the roof of the

nose and is withdrawn, the removed piece of tissue being dropped into a glass of boric-acid solution. The procedure is repeated through the same and the other nostril, until no more adenoid growths can be felt with the fingers and the beak of the forceps encounters firm fibrous tissue over the entire site of the growth. The vegetations in the fossa of Rosenmueller (recessus pharyn-

Fig. 2. Lateral view of a sagittal section of the head. The finger is inserted in the nasopharynx and is guiding an adenoid growth into the jaws of the forceps. T, tuba auditiva.

geus), those on the posterior pharyngeal wall, those in the highest part of the pharyngeal vault, and the adenoid growths in the posterior nares are all readily reached and torn away. By crowding the beak of the instrument into the growths their removal to the bottom of the lymphoid tissue is assured and there is no difficulty in entering hollow places in searching for it.

The index finger is withdrawn from time to time to give the child a spell of unobstructed breathing. The operation is not lengthy and may be performed in a few minutes, the forceps often taking the greater part of the mass of the pharyngeal tonsil in one bite. The accuracy with which pendulous growths may be guided into the jaws of the instrument is most pleasing, as well as the exactness with which every vestige of adenoid tissue may be removed from the places inaccessible to the ringknife mentioned. The precision with which the pernasal forceps does its work is due in part to the constant control of its presence by the palpating ball of the index finger, the finger and the forceps as it emerges from and recedes towards the nose constantly meeting in concerted action. An attempt to similarly feel of the postnasal forceps while it is seizing the growths is always imperfect, as the presence of the instrument and finger in the nasopharynx at the same time is a hindrance to both, especially in small throats, and where control by palpation is attempted at all it has usually to be done with the nail and not the ball of the index finger. One of the chief advantages of the pernasal forceps over the postnasal one and over all other instruments operating by way of the mouth is that it pushes the adenoid growths out of the posterior nares, making them accessible and attacking their foremost part where the obstruction to nasal respiration is greatest, while the tendency of the postnasal instruments is to crowd the vegetations forward into the choanæ beyond their reach. This became strikingly evident to me in the cases where I finished operations begun with the postnasal forceps by means of the pernasal one, which pushed out of the posterior nares and removed astonishingly large remains of adenoid tissue after I had deemed all of it taken away with the postnasal forceps.

The tubal prominences in the operation through the nose are not in danger, as they may readily be felt and protected by the index finger. As in all things, experience is required to acquire the technique of the operation I have described and for its rapid performance, but I have had no difficulty in teaching the method to my assistants and pupils. I have never known of a return of the adenoid vegetations after this mode of operation, and the children all cease their mouth breathing after a few days to a week. Though I do not deny that a true mouth-breathing habit may exist in some cases in children possessing a free way for

nasal respiration, as a rule a child that continues to use his mouth for breathing after an operation for adenoid vegetations has not been completely relieved of them.

Excepting in one case, I have never seen injury to the nose from the operation; at the most a moderate reactionary swelling of the mucosa partially occludes the nares for a few days, and this slight nasal irritation is a small price to pay for the assurance that the removal of the adenoid growths has been radical. In the one case referred to a small adhesion formed between a lower turbinated body and the septum as a result of abrasion of the mucosa by a roughened, projecting screwhead at the lock of the forceps. To avoid a repetition of this accident I have sunk the screwhead and also have had the sharp corners of the jaws below the lock rounded off. I have never had unusual hemorrhage during the operation, and have had no postoperative bleeding. In adults and older children it may be performed without chloroform with merely cocaine anesthesia, pure cocaine flakes being conveyed by a minute moist swab through the nose and postnasally into the nasopharynx and applied along the route of the forceps. Done in this way, the operation is not especially painful, but nevertheless requires rather courageous patients. No aftertreatment is required. Enlarged tonsils may be removed as a preliminary.

The procedure I have described differs so radically from the traditions that I expect it to meet with little favor, at least at first. In its defence I can say that those who have seen me operate by this method all seem convinced of its merits, and my pupils are its enthusiastic advocates. The instrumentarium is exceedingly simple and inexpensive, and I hope that a few will make use of it, at least to supplement the instruments they are accustomed to where growths unreachable by the ringknife need removal from the fossa of Rosenmueller, the choanæ, and the posterior pharyngeal wall. I also suggest its employment where a relapse after a currettement indicates the use of another method.

Discussion.

DR. E. FLETCHER INGALS.—Mr. Chairman: For fifteen or twenty years I have used the straight forceps of this kind through the nostrils for clearing out the choanæ or removing any masses that may remain in the upper part of the pharynx. I think it im-

portant and I invariably pass the forceps through the nares to the nasopharynx, because every now and then we find atresia or complete obstruction of one or both choanæ that may be opened in this way. I remember operating on a child about ten years ago that had already been operated on two or three times for the removal of adenoids but had not been relieved of the mouth breathing. I found no pharyngeal tonsil, but both choanæ were nearly closed. By passing the forceps through the nose it was easy to break through the obstruction and open the posterior nares to full size. I always remove the adenoids carefully and thoroughly and make sure that the choanæ are patent. I think for this reason I have never had a case of recurrence of adenoids, although statistics show that about 25 per cent. return.

I do not feel as safe in the use of cocaine as does the author of the paper. I have seen several patients in whom I believe cocaine used as he uses it would have caused a fatal result. It is possible that the employment of adrenalin with the cocaine in the nares prevents to a great extent the constitutional effects of the latter by preventing its absorption, but I feel that caution is necessary.

DR. J. H. BRYAN.—I would like to know what kind of cocaine Dr. Freer is using. Certainly to the cocaine we are using in the East children as young as his are not at all tolerant. I think it is very generally conceded that chloroform is the worst drug we can give under the circumstances. Most all of the deaths reported from general anesthesia have been from the use of chloroform.

DR. EMIL MAYER.—It seems as though these instruments are exceedingly sharp. Dr. Freer speaks of chloroform anesthesia, and it seems to me that some day he will do one of the operations on a child under chloroform and he will receive a shock if that patient should die of the anesthetic.

To use a dangerous anesthetic in operations of this character, where the whole procedure is one that is done solely to improve health and therefore not vitally necessary, is in my opinion exceedingly reckless and hazardous. There are safe anesthetics. The dangerous ones should not be used.

DR. J. SOLIS-COHEN.—A good many years ago a deceased Fellow of our body, who received his first inspiration from my ministrations, Prof. Harrison Allen, on passing a probe along the floor of the nose noticed that it touched the roof of the pharynx at about the point where these adenoid growths occurred, and from that time he adopted the plan of using an instrument of this kind for removing the remnants of the adenoids after their removal as far as possible by other methods. Whether he ever resorted to it for removal of the entire growth I do not know.

Now, as to chloroform. Up to a certain time there was hardly anybody in this country that saw more cases of adenoids than I did. I performed the first operations in this country, and have never used any other anesthetic than chloroform, and I have

never seen any difficulty from it. I feel certain that I am under the impression that the deaths that occur have not been as largely due to chloroform as is supposed, and that they occur also under ether. It has been said that in giving chloroform through the nasal passages we have to be exceedingly careful on account of reflex depression. My method has usually been to have the nose held and to commence the anesthesia through the mouth, beginning with a little cologne, and the chloroform being added little by little, and then to release the nose so as to continue through the natural route of respiration.

DR. GEORGE B. WOOD.—Concerning chloroform anesthesia in cases of enlarged tonsils and adenoids, I would like to add just one word to what has already been said. Sudden death from chloroform during an operation is probably due to arrest of the heart in diastole. This is the dangerous feature of this drug as an anesthetic, but for some reason in cases of adenoid hyperplasia this arrest of the heart seems to be more readily brought about than in normal individuals. Professor Kocher, of Bern, told me that he had had three deaths from chloroform anesthesia, in all of which there were enlarged thymus glands. He had been accustomed to begin his anesthesia with chloroform, following it with ether, but the occurrence of these three deaths led him to use bromide of ethyl instead of the chloroform, and since then he has had no deaths directly referable to the anesthesia.

DR. T. H. HALSTED.— I had the misfortune some five or six years ago of having a death from chloroform in operating for adenoids. It is a fearful experience, and from that day to this I have never used chloroform in this operation, because children with adenoids and enlarged tonsils are of the lymphatic diathesis, and are peculiarly susceptible to the danger of chloroform. Whether they be operated upon for adenoids or for any other condition demanding a general anesthetic, chloroform is very distinctly contraindicated in children of the lymphatic diathesis, of which adenoids and enlarged tonsils are an expression.

DR. J. E. RHODES.—So far as the method is concerned, I have nothing to say except in commendation, because I am using it for removing the vestiges of the growth, as recommended by Dr. Freer. In removing these it is surprising with what facility one can reach every part of the nasopharynx by the nasal route. I have been surprised at the facility with which masses are pushed into the jaws of the forceps and in clearing up the nasal pharynx the instrument and method are certainly valuable.

Since the discussions that have taken place in our Association with reference to chloroform and ether, I have abandoned the use of chloroform entirely, and I give only ether by the drop method. So far as the use of cocaine also is concerned, I have not thought it necessary, when the child is under an anesthetic, to resort to the use of cocaine in the nasal cavities. I think that portion of the

operation might as well be abandoned. The facility with which one can do the operation and the simplicity of the instrumentarium should commend themselves to everyone.

DR. WM. LINCOLN.—I have listened with interest to Dr. Freer's remarks. The instrument he shows seems to be an ingenious method of attacking this growth in the nasopharynx. It strikes me, however, that considerable time is consumed in performing the operation and that it can be done, according to my own experience, equally well by most of the other methods usually pursued. In the great majority of cases in my hands I find that the ringknife variously modified, using three of four forms of the same instrument, is perfectly satisfactory. I understood Dr. Freer also to say that in cases where he had operated to relieve adenoids, and the mouth breathing caused by the adenoids had not been relieved in the course of a few days, he considered the operation not successful. I cannot agree with that, because there are many other causes that will bring about mouth breathing, as I will try to show in my paper. I agree with what Dr. Wood has said about the danger of chloroform. I think we have safer anesthetics, and it is our duty to use them.

DR. JOHN R. WINSLOW.—Some years ago, Dr. E. J. Moure of Bordeaux published an article in the *Revue hebdomadaire de Laryngologie* in which he pictured the great variability in the conformation of the nasopharynx, and it seems to me that this gives us the keynote of the treatment of this condition. The varieties of anatomical conformation are as various as the facial expression, and a preliminary study of the shape and relations of the nasopharynx prior to operation is essential. There is no one instrument nor one shape of instrument that will effect a radical operation in all cases, in my judgment. I think the method of Dr. Freer is a valuable accessory to the methods in common use. I would advocate a careful examination of the nasopharynx prior to operation with the mirror when possible, or with the finger under anesthesia, and a sufficient variety of instruments to carry out at the time of operation any manipulative measures that may be necessary to meet the conditions presented.

With regard to chloroform, there is one point that I have observed that has not been brought out. I do not believe that chloroform is as successfully administered at the present time in the average hospital as it used to be. In other words, I do not think that the hospital interne has the same experience and skill in the administration of chloroform that he used to have. I know that a good many years ago, when I was in general practice, I used chloroform extensively without any more than the slightest precautions, and still I seldom saw any serious complications. From my observation of the administration of chloroform in the rare cases in which it is now used in the general hospital, and I may include all of them I think, I do not regard its administration

as skilled or safe. I would rather administer it myself than entrust it to the average hospital internes, who have gotten out of the way of using chloroform and crowd its administration too much, while they are experts in using other anesthetics. Whether this is the case in hospitals elsewhere I do not know, but I am sure it is the case in our part of the country.

DR. FREER.—It seems to me that my paper has elicited a discussion on chloroform rather than on the operation I described. Still I am pleased to find that the ringknife has so few defenders in this society. I think that Dr. Ingals has a wrong impression as to the amount of cocaine employed by me in operations. For intranasal operations without general narcosis I do not think that I use larger quantities than he does, but I employ the drug pure, in the form of Merck's flake crystals, therefore in the utmost concentration. I think that the same amount of cocaine used in this way gives a more profound local insensibility than when it is diluted and also think that the energetic contraction of the vessels produced by the pure drug aided by preceding adrenalin positively prevents poisoning. In this way I account for the freedom from toxic symptoms of consequence in all of my submucous resections, now 171, and in the many other intranasal operations I have performed. The worst that I have ever seen is tachycardia.

The attack on chloroform by Dr. Mayer and others is not unexpected to me, and I am fully aware of the dangers of a full chloroform narcosis for operations on adenoid growths in children. I do not, however, use a full nor even a half narcosis, but depend on the very moderate amount of cocaine employed to help prevent pain. I have found this combination of cocaine and chloroform very useful, especially in the submucous resection for children where the local insensibility permits the operation to be conducted with merely enough chloroform to keep the child from being frightened by its surroundings. I too have had scares from chloroform, and have found that the danger from it is not due to the effect of the chloroform upon the heart but to asphyxiation due to dropping back of the tongue. The nose is already closed by the adenoids and with the mouth and pharynx also occluded by dropping back of the tongue it is obvious that the child cannot breathe. In the few alarming cases I saw in my earlier practice, before I learned to look out for these conditions, the child was always blue and obviously becoming asphyxiated. Now I have the tongue-forceps always ready for the least sign of imperfect breathing. I also use but a slight narcosis, as stated, and find that chloroform watched in this way is not dangerous. I have used ether repeatedly, but always came back to chloroform used in the manner stated. I am very glad to see that Dr. Cohen, with his vast experience, has sustained me.

It is true that the ringknife gives a satisfactory result in the majority of cases, but there is large minority in which it does not.

The trouble with the instrument is that it operates blindly and it is impossible for the operator to tell whether he has removed all of the growth or not. The location of the adenoids varies greatly, as I have shown. At one time they are placed mainly on the posterior wall, at another in the choanæ, and again in the fossa of Rosenmueller. Then there are the regional anatomical conditions pointed out to be considered. Any operation therefore that is done with an instrument that is introduced into the nasopharynx without the sense of touch to guide it is sure to be uncertain in its results. In addition, as I have shown in my paper, the ring-knife conforms itself neither to the anatomical nor the pathological variations encountered. In contrast to this the pernasal forceps can reach any origin of the vegetations, and in using it one does not need to consider anatomical variations at all except a marked deflection of the nasal septum. Should such exist it should be removed before operating upon the adenoid growths.

HYSTERICAL MUTISM.

BY G. HUDSON-MAKUEN, M.D.

SPEECH is the product of a definite co-ordinate action of three important mechanisms: the respiratory, the phonatory, and the articulatory. Each one of these mechanisms may be used independently of the other two and is independently and separately represented in the cerebral cortex, but for the production of speech their co-ordinate action is required.

Voice is the material of which speech is made. There are two distinct kinds of voice, the resonant and the nonresonant or whispered. Resonant voice is characterized by tones that are more or less musical, while whispered voice is soft, comparatively weak, and aspirated.

The physiology of resonant voice is fairly well established, while that of whispered voice is still a subject for discussion. Charcot in his lectures taught that the larynx is not the seat of whispered sounds; that they originate, rather, in certain contracted portions of the pharynx; while Wyllie, somewhat later, in pointing out Charçot's error, claimed that whispered sounds can only come from the larynx. That Charcot was wrong can easily be demonstrated by the use of the laryngoscope, and one at all skilled in the practice of the voice and in the location of subjective laryngeal sensations can feel the whispered voice in the larynx, especially in the production of the so-called stage whisper. Wyllie was also in error when he said that the whispered voice can *only* come from the larynx, for it has since been shown that a kind of whispering is possible without any larynx at all, and even without any connection between the articulatory and respiratory mechanisms. Whispering so produced, however, is forced and unnatural, and furnishes, therefore, additional proof that the larynx is the seat of normal whispering, as it is of resonant sounds. This fact has a very direct bearing upon the subject under discussion; and it is of great practical importance, also, in the treatment of diseases of the larynx. If whispered sounds do

not require the use of the larynx, whispering need not be interdicted in acute laryngitis, for instance, but it is a clinical fact that whispering puts even a greater strain upon the larynx than does resonant vocalization, because of the greater respiratory friction required.

The inability to produce resonant sounds is called aphonia, and the inability to produce whispered sounds has been called apsithyria (Dr. J. Solis-Cohen); while the inability to produce either resonant or whispered sounds is called mutism. A differential diagnosis between these three disorders of speech, aphonia, apsithyria, and mutism, is not difficult to make, but we often find them somewhat confused.

All vocal sounds are produced by co-ordinate action of the phonatory and respiratory mechanisms. The independent action of each of these two mechanisms may be apparently excellent, but if for any reason their co-ordinate action is not possible there can be no vocal sounds or phonation. We may then have aphonia and even apsithyria with no paralysis whatsoever of the vocal cords or any of the intrinsic muscles of the larynx, except only during attempts to co-ordinate them with the respiratory mechanism in the production of speech. The phonatory mechanism may functionate properly until the respiratory mechanism is called upon to do its part, when it immediately ceases to functionate at all, and the vocal cords fall apart, owing to a complete relaxation of the adductor muscles. There seems to be a paralysis of the mechanism of co-ordination.

Apsithyria, or the inability to whisper, is merely an aggravated form of the condition that results in aphonia. There is a more profound phonatory and respiratory disability during efforts at co-ordinate action for speech, and neither the approximation of the vocal bands nor the expiratory blast of air is adequate even for the weaker form of vocalization, which we call whispering. If we admit this theory as to the laryngeal origin of whispering and the causation of apsithyria, we must regard whispering as a kind of phonation and apsithyria as a profounder form of aphonia.

Mutism is a combination of aphonia and apsithyria, with a disability also of the articulatory mechanism. An absolute mute can produce neither resonant nor whispered sounds, and he can make no accurate articulatory movements whatsoever. The patient may be able to use the labial, lingual, and palatal muscles freely

in the acts of mastication and deglutition, but he cannot use them in articulatory movements. It is not always apparent at first whether this latter disability is of direct psychic origin, or whether it is due to the unusualness of trying to make articulatory movements when no sound, either resonant or whispered, is forthcoming from the larynx to be articulated. However that may be, there is here also a lack of the power of co-ordination, a similar condition to that which we found to be the immediate cause of aphonia.

Much speculative discussion has arisen, in considering the causation of both aphonia and mutism, as to which of the mechanisms is at fault; as to whether it is the laryngeal or respiratory in aphonia, or the laryngeal, respiratory, or articulatory in mutism. But from what has been said above it would seem more in accordance with the facts to regard the causation as not belonging to any one mechanism, but as being a faulty co-ordination of those that are used. There is a faulty co-ordination of the laryngeal and respiratory mechanisms in aphonia, and of these two and the articulatory mechanism in mutism. In making a differential diagnosis, therefore, it will be helpful to keep in mind that the aphonic patient is unable to produce resonant sounds, that the apsithyric is both aphonic and unable, also, to produce even whispered sounds, and that the mute is both aphonic and apsithyric, and non-articulative as well.

The terms aphonia and mutism have been used in scientific discussions with too little regard for their exact meaning. Aphonia should be used to describe a condition of complete phonatory disability, and it should include apsithyria; while mutism should be reserved to describe a condition of complete phonatory and articulatory disability. If these precise significations were given to the terms there would be less liability to the confusion of them with the various forms of aphasia.

Aphemia, or motor aphasia, is often confounded with mutism, but the aphasic are not altogether mute. They are always able to produce rambling sounds or words, and this is the distinction which should be made between the two conditions. Moreover, mutism may be of organic origin, the result of actual organic lesions of the brain, and thus it may be very like aphasia; but I would call it aphasia when any kind of phonatory sounds, meaningless or otherwise, is possible, and aphonia when such sounds

are not possible, and mutism when there is also articulatory disability. The diagnosis between organic mutism and functional or hysterical mutism is often difficult. It should be borne in mind that the two conditions may exist simultaneously, and that in hysterical mutism we generally have other hysterical stigmata.

Hysteria is not an organic disease. It is not a disease of the peripheral organs, of the spinal cord, nor of the medulla, but it is a disease of the mind, using the term "mind" in a scientific sense, as being the product of certain "unknown alterations of the cerebral cells," and representing the highest functions of the brain. It has been called a "psychologic disaggregation," a "psychologic lesion," a "disease of the personality." In any case it is very real, very distressing, and worthy of our best attention.

Hysteria, as it affects the vocal organs, does not differ essentially from that which affects other organs of the body. In hysterical mutism, for instance, the psychologic disaggregation or lesion happens to be in that particular portion of the brain which presides over the faculty of speech, and there may be no other hysterical manifestations, although associated with the affection we often have sensory disturbances, such as anesthesia or hyperesthesia of certain portions of the respiratory tract. These sensory conditions may precede the speech disturbances and constitute a direct causal factor. Anesthesia of the larynx, whether or not it be of hysterical origin, is quite sufficient in itself to cause disturbances of speech, because the faculty of speech depends for its integrity upon certain kinesthetic memories, the existence of which would be impossible if there were no laryngeal sensations transmitted to the brain.

The interesting and very unusual case that suggested this paper was seen by me in consultation with the Doctors Mitchell, of Philadelphia, and a full report of it by Dr. John K. Mitchell will shortly appear in the "Proceedings of the American Neurological Society." Through the courtesy of the author of the report I am permitted to make use of it at this time.

The patient, 22 years of age, was employed on a railway train, and during the switching of cars was standing upon the roof of one of them, giving directions to the engineer. He said he failed to see a live trolley wire, extending over the track, until, as he turned suddenly, it struck him across the bridge of the nose and the right orbit, giving him a decided "electric shock" and throw-

ing him violently to the roof of the car. He claimed that he was unconscious for twenty-four hours, but the physicians who saw him in the hospital a few minutes after the accident said that he merely appeared dazed for a few hours, and that there was only a slight brush burn at the seat of injury. Aside from a severe frontal headache and tinnitus aurium on the right side, his only important symptom was a complete loss of the faculty of speech.

It was nine and a half months after the accident that I had the pleasure of seeing him with Dr. John K. Mitchell, who allowed me to use his notes in connection with my studies of the case.

The patient's family history, except for a slight neurotic temperament, seemed to be negative. He had scarlatina, at 8 years, with no sequelæ. He had typhoid fever, lasting eight weeks, two years before the accident; and he also had several recent attacks of tonsillitis, with abscess formations but no laryngeal involvement. It has been observed that typhoid fever occasionally induces hysteria in those predisposed to the affection, and it is quite possible that the tonsillitis, a very severe attack of which occurred only a few months before, may have been an additional causal factor.

The patient complained of sharp shooting pains throughout the body. He had lost twenty-five pounds in weight. The thoracic examination was negative. Sensations were normal externally, as were also the reflexes and electric reactions. There was no muscular inco-ordination except in the mechanisms of speech. The headache and tinnitus continued with more or less severity, there was great mental depression, and his sleep was much disturbed by dreams. The eye ground, as reported by Dr. H. Maxwell Langdon, was in every respect normal except for the complete reversal of the red and green color fields.

From my own examination of the organs of speech I made the following notes, which will appear in Dr. Mitchell's report:

The aural condition was normal and there had always been good hearing.

The nasal septum was deviated toward the right, and on its convex side there was a spur extending well back into the nostril and causing a considerable pressure upon the middle turbinal bone. As a result of this structural irregularity there was a slight catarrhal process in both the nasal and nasopharyngeal cavities. The spur was removed by Dr. Walter J. Freeman, leaving the nostrils entirely free and improving the general condition, but having no effect whatever upon the restoration of speech.

The oral cavity was in good condition, the alveolar and palatal arches were regular in shape, and the patient had good voluntary control of the tongue for all purposes except articulation.

The faucial tonsils were slightly hypertrophied, and they con-

tained some old contractions and adhesions, due to the repeated attacks of tonsillitis.

The pharynx was congested, and there was slight anesthesia of its mucous membrane. This condition of anesthesia was present, even to a more marked degree, in the larynx. An applicator passed beyond the epiglottis was easily tolerated without any reflex muscular contraction.

The laryngoscope revealed nothing unusual except the patient's inability to hold the cords in approximation and to make them vibrate during an attempt at phonation. He could easily approximate the cords, but they immediately flew apart at the slightest attempt toward phonation. He could give the so-called "glottic click" that is often practised by vocal teachers for the purpose of developing and strengthening the muscles of the larynx, and he could give the normal vocalized cough, but it always vanished into a faint breath sound. He could not prolong the cough for any appreciable length of time.

It was found that he had completely lost the power of phonation. He could produce neither resonant nor whispered sounds. He did not know how to begin to try. He was not only aphonic but he was mute. He lacked the mental conception of articulative movements as well as that of the movements for vocalization. He could whistle and smile, but he could not laugh. In the hypnotic state in which I appeared to have him at one time his attempts to speak were also fruitless.

All the known methods were used to try to restore the lost faculty, but no laryngeal sound could be elicited beyond a very limited whisper, and but slight articulative movements could be developed; and even these could not be retained in the consciousness. He could hear words and see words, but he could not speak them. He could write a clear description of his case in a rapid and legible hand.

Instruction under my immediate direction was carried on daily for several weeks, with the result of the acquirement of only a few short partially whispered words, the kinesthetic memories of which could not be established. He could be taught to whisper faintly a short monosyllabic word, but in a few seconds he seemed not to know how to try to repeat it. He seemed to forget how to do it. It was as if he would not do it; indeed so much did it seem to be a lack of desire that some observers thought he was simulating. This seemed the more probable in view of a pending suit for damages. The fact is, however, that he could not speak, or, rather, he could not will to speak. He had lost the motor representations necessary to co-ordinate the various mechanisms of speech. There was a "psychologic lesion" in the motor centers for speech, a disaggregation of cells in the psychomotor speech centers.

He said he wanted to speak, but did not know how to go about it. His mother said that he had spoken distinctly three or four words on one occasion since the accident, and although awake he did not know it; and his sister once heard him talking in his sleep loud enough to awaken her in a room below.

The patient was in the Infirmary for Nervous Diseases for about four months, and at least ten or twelve physicians engaged in his examination and treatment. He went out daily, had house diet, faradic brush to larynx, externally and internally; fly blister over the speech centers on the left side of the head, general massage, strych. nitr. gr. 1-100 hypodermatically in alternate sides of neck each day, regular instruction in my office in breathing and calisthenics, with the employment of every means known to me for the restoration of phonation; daily suggestive exercises during partial hypnosis, by Dr. Augustus A. Eshner, for five weeks; removal of spur, with suggestion, by Dr. Freeman; attempts to induce phonation in the unconscious state of sleep at night, and during etherization, and sudden blows upon the epigastrium to surprise him into speech. But all this was of no avail and some of us were beginning to grow weary of seeing him.

During the fourth month, however, he had two typical hysterical seizures, about sixteen days apart, and in the second one, which was very severe and happened in the middle of the night, the silence of fifteen months was broken, his first words being uttered in a state of unconsciousness. When aromatic spirits of ammonia was held near his nose he coughed and said, in a firm voice, "Take it away. I don't want to smell it."

He was gradually awakened, and wanted to keep on talking all night. He finally went to sleep, and in the morning, except for a headache, seemed well and happy and wanted to go home. Dr. G. E. DeSchweinitz examined his eyes and found a normal condition of the color fields. The patient continued his physical exercises with us for several days and then went home. A few days ago, six months after the return of his speech, in reply to a letter from me asking about his condition he said: "I would state that I have been troubled with my speech very little since its restoration last November, except that sometimes on attempting to speak I find difficulty in making a sound for an instant, then it is all right again. At such times I feel just as I did before I regained my power of speech. I have suffered all along with that pain in my head; sometimes it is very severe, until the last two weeks it is better. Have been unable to do any regular work, owing to the state of my nerves, my rest at night is so poor. It is not uncommon for me to be unable to sleep until daylight, and sometimes I go for a week without averaging over one or two hours sleep each night, until I am completely ex-

hausted. The recovery of my speech has been so much to me that other ills have appeared less."

Summary and Conclusions.—Mutism is the result of a disability of the phonatory and articulatory mechanisms.

It may be of either organic or functional origin, or both.

The functional variety generally occurs in hysterical subjects.

Hysterical mutism is merely a symptom of the disease hysteria.

It may be the only symptom, but it is generally one of many.

It may continue for years in spite of everything that can be done.

Physical exercises that do not tend to remove the psychic factor in the causation are of little value.

It may be removed temporarily without curing the disease.

The treatment is in the nature of suggestion and schemes for the beguilement of the patient into normal speech.

Hypnotic suggestion is here indicated, but hysterical mutes are not good subjects for hypnosis.

A great nervous or psychic shock, such as sometimes causes the symptom, may be required for the removal of it.

After the removal of the symptom the treatment of the disease should continue for a long time, and there should follow a course in phonetics, in elocution if you please, which should have for its purpose the establishment of accurate kinesthetic memories and a sound mental attitude toward the production of voice and speech.

Discussion.

DR. J. SOLIS-COHEN.—The reader tells me that he referred to me in this connection. I know that a good many years ago I reported a number of cases similar to his, and I remember that in one of them, and most of them were females, a lady had been in this condition for a number of years when a sudden fire occurred in the house she lived in. She jumped up, and recovered immediately. In another instance the girl heard away from home of the death of her father, to whom she was much attached, and she recovered almost instantly. I believe Dr. Makuen has hit the mark when he said that this patient could not will when he wanted to speak; just as Sir James Paget used to say in some of his cases of paralysis of the bladder that the patients could not will to micturate. I do not know much about the morphology of

the brain, but it strikes me that I have read that somebody has said there are a lot of spindle cells touching each other endwise through which the will is conveyed to the muscles. When the ends are dislodged the will cannot be conveyed to the muscles. That is quite plausible. In a somewhat similar manner a watch is out of order; something out of gear that cannot be detected on mere inspection; give the watch a shake, and it may go on again all right. The parts have become readjusted. It may be that some of the spindle ends that convey the will were disturbed by the shock that the man got on the railroad; and under certain conditions another shock might eventually have got them into reposition, and the will current, whatever it may be, became established. I do not know.

DR. E. FLETCHER INGALS.—I would like to ask the author of the paper about the patient I have referred to, who talked well in spite of a complete laryngectomy, the trachea having been cut and attached to the skin so there was no connection between the lungs and the mouth. How does this man talk aloud? I noticed the last time I saw him that when he wished to talk distinctly and loudly he first filled his chest with air. He said he could not talk aloud without first getting a full breath. Another patient on whom I had done a complete laryngectomy whispers easily, but does not talk aloud.

DR. COHEN.—In my case of laryngotomy the patient inhaled the air into his neck and produced a distension somewhat like to a rubber ball, and then he was able to speak a sentence of ten or twelve words at a time. The vocal mechanism was done by the inferior constrictors of the pharynx.

DR. J. PRICE-BROWN.—I would like to refer to a case which came to my attention recently in a lady aged 68 years. Six months ago she had a severe attack of bronchitis attended by hoarseness and loss of voice. The cough gradually ceased, but the voice did not return and six weeks ago she was referred to me. I examined the vocal cords and they acted normally. Still in the tone of ordinary speech she cannot vocalize, while in a falsetto tone she can. I had her examined by X-ray a few days afterward, but nothing was found to indicate pressure on the recurrent laryngeals; the second examination was like the first; she can repeat "ah" at a very high pitch but cannot vocalize in any other way.

DR, EMIL MAYER.—I would like to ask Dr. Makuen whether in hysterical mutism complete anesthesia has been tried, and whether the patient on coming out would make a sound. In one such case I made an examination under complete anesthesia, and the patient made no sound on coming out from the anesthesia.

DR. H. L. SWAIN.—I once saw a patient with hysterical blindness which greatly interested me. In that the effect of nitro-

glycerin was most satisfactory. I at first supposed that the blindness was due to spasm of the arteries of the retina, and yet the trouble extended over two weeks, during all of which time it could have hardly been possible that the spasm of the arteries could have continuously existed. Yet nitroglycerin given at periods through the day seemed to give glimmers of faint light, untii a gradual but complete recovery ensued. I do not know whether you could conclude that in your patient there was spasm of the vessels in the speech center.

DR. COHEN.—The Doctor's case that has just been mentioned reminds me of a case we had the first year of our polyclinic, about twenty years ago in Philadelphia, in which there was also hysterical blindness and other manifestations of hysteria. That girl went from one professor to the other; so that we had a polyclinic patient indeed, for the girl was used in nearly every one of the departments as an example in hysteria.

DR. MAKUEN.—I think Dr. Cohen's illustration of the watch is an apt one in this connection, and although, as he has said, he may not know all about the brain, he certainly describes very accurately what takes place in these hysterical cases. There is a "psychologic lesion," a real condition, one that, with improved instrumentation, may some day be demonstrated. The day has not yet come, however, for Dr. S. Weir Mitchell and Dr. W. G. Spiller recently reported a case of typical and uncomplicated hysteria, that had been under observation for thirty years, and the autopsy revealed no representative cerebral lesion. But there must be some change in the structure of the cells or some disturbance in their relation to bring about the peculiar psychic conditions which we call hysteria. Many stammerers are hysterical subjects, and their psychic condition resembles in all respects that of aphonics and mutes.

I cannot explain how Dr. Ingal's patient talks in a loud voice. I had the pleasure of studying Dr. Cohen's patient at some length, and working with him along this very line, and I think Dr. Cohen's explanation as to the physiology of his whispered voice is quite correct.

I should say that Dr. Cohen's patient spoke in a loud or stage whisper, rather than in a resonant voice; and he was able to use the ingoing as well as the outgoing air.

He seemed to have developed a little pocket in the lower pharyngeal region, which became inflated as the air rushed in. The theory of the possible utilization of the stomach as an air reservoir for purposes of speech is one that I am not decided upon. However that may be, they all soon learn that a more resonant tone may be produced when the lungs are full, and they therefore try to speak with the chest inflated.

The falsetto voice is very easily corrected. It usually continues

to exist largely because of a false subjective notion of the character of the normal voice. The patient must be shown how to correct his faulty respiratory and vocal technique, and his ear must be trained to recognize the normal resonant tones after he is able to produce them. Several weeks of training may be required to give him facility in the use of the new voice. I sent a young man home to Virginia the other day who formerly spoke away up here (indicates) all the time, and now he speaks in a beautifully modulated resonant tone. His natural voice is deeper than mine.

As I said in my paper, ether anesthesia was tried in the case reported, but no sound could be elicited. Attempts were also made to have him talk during his natural sleep, but this also failed, although his mother and sister heard him talk in his sleep on one or two occasions. He talked once while he was awake, his mother said, and did not seem to know it. That is a curious thing. So firmly fixed was the idea that he could not talk, he did not know when he was talking. The condition is analogous in some respects to that of the man who does not know that his falsetto voice is not the normal voice, and to that of the stammerer who does not know when he is stammering.

In the case of blindness that Dr. Swain speaks of, there was probably a physical cause for the trouble at first, with a final development of a latent hysteria, which lasted for five years.

SARCOMA OF THE NASOPHARYNX—TREATMENT BY INJECTIONS OF ADRENALIN.

BY JOHN EDWIN RHODES, M.D.

THE prognosis of sarcoma of the nasopharynx is so uniformly bad that any treatment that offers hope for either the amelioration of the symptoms or a possibility of cure deserves our attention. Having recently had an opportunity of trying a remedy in an inoperable and unfavorable case of sarcoma of the rhinopharynx with encouraging results, I wish to present the method employed to the Fellows of the Association with the hope that it may be found worthy of further trial in other cases. The treatment employed was first suggested by Mahu, in 1903, and was recently used in a case of carcinoma of the rhinopharynx by Berdier and Falabert with very marked benefit.

Mrs. B. G., 22 years of age, married seven months, was sent to me January 19, 1906, by Dr. G. E. Turrill, of Cleveland, Ohio. Her mother was living and well, and her father had died of erysipelas following an injury. There was no history of hereditary disease in the family. She had not been well for about twelve years, and for the last three years had been subject to attacks of bronchitis. She had measles in childhood, and had had several attacks of tonsillitis in the preceding three years. She said that she had a growth removed from the back of her throat five years ago, and that this had been growing for seven years previously. She had complete relief of all the symptoms connected with this growth by the operation, and had no further trouble until seven months ago, about the time of her marriage. The early symptoms were those of a cold in the head, and she had been under treatment since the condition first appeared. About this time she had an attack of what was diagnosed pertussis, and the growth in the throat, which had been increasing in size slowly before that time, began to grow more rapidly and continued to enlarge until about two months previous to her visit, since which time it had seemed to remain stationary. When first seen she complained of a large growth in the back of the throat, completely obstructing the nasal passages, so that no air entered them at all; she also had marked loss of hearing, progressively increasing; severe pains at times in the back of the neck radiating to the

vertex; a profuse discharge in the nares, which could not be completely removed, because of the obstruction, and also symptoms of dryness of the throat, etc., from the necessity of breathing through the mouth continually. There had been a constant loss of weight, declining from a normal weight of one hundred and twenty-five pounds seven months ago to ninety-two at that time. The appetite was poor, but there had been no fault of digestion and the bowels were regular. Her tongue was thickly coated and dry. Her menses had been regular and normal. She said she had become nervous of late. The patient was much emaciated and pale, but her strength was comparatively good, and she was able to come to the office for treatment during the time I had her under observation, although an increasing weakness was evident. She breathed through the mouth, and her voice was the characteristic voice found in complete nasal occlusion. The temperature was 98 F, and the pulse 128—feeble, of small volume, but regular. The heart and lungs were normal.

The nasal cavities were free anteriorly, but the choanæ were completely occluded, and the nares were partly filled with thick mucous. The tonsils, uvula, palate, tongue, and larynx were normal. A tumor mass presented on the pharyngeal wall, descending to the level of the laryngeal vestibule, and gradually sloping forward and upward behind the velum palati, pressing the latter forward against the posterior molars of the upper jaw. Palpation showed this tumor to be attached on its posterior aspect only, as the finger could be forced between it and the soft palate and choanæ and the Eustachian cushions could be felt by firm pressure. So the tumor had a broad base of attachment of the nasopharyngeal and pharyngeal wall, and undoubtedly originated from the former. It was firm but not hard, somewhat lobulated, and was pinkish in color, and on raising the soft palate its surface was seen to be mottled with bright red spots. It did not bleed easily and there were no points of ulceration.

A diagnosis of sarcoma was made and I sent her to the hospital, and the next day removed a mass of the growth for microscopical examination, which showed a spindle-celled sarcoma, highly cellular with many lymphoid cells. Considering everything in the case, especially the certainty of a speedy recurrence of the growth, an operation could not be advised, and at the solicitation of the husband that something be done I made injections of adrenalin into the substance of the tumor daily. For this purpose I used a needle long enough to reach the tumor through the nasal cavities. I had the following solution prepared by my druggist:

℞ Adrenalin chloride..... 0.12
Acid boric..... 0.60
Chloretone 0.025
Aqua destillata..... 15.

Ten minims equal five milligrams of adrenalin chloride.

An injection of five minims of this solution was made into the faucial portion of the growth on January 25th and a 1-1000 solution of adrenalin was swabbed over the surface. About twenty minutes after the injection she had some nausea, but there was no faintness or any appreciable effect on the pulse. An ulcerated spot had appeared on the anterior surface of the soft palate, due to its being crowded against the left posterior molar by the pressure forward of the tumor, so the injection was made into the portion of the tumor directly behind the ulcerated spot. On the 27th I injected ten minims of the solution into another place. On the following day I injected the tumor through the right naris, and the next day through the left. In this way I alternated the site of puncture. After the second treatment diminution in the size of the growth was apparent. On the 30th the retraction was shown by the removal of the pressure from the site of the ulcer and the healing of the same. There was an almost complete restoration of hearing, from the removal of pressure from the Eustachian tubes, and the pain was very much less. I made seven injections, and it was then thought advisable to send her home and to have the treatment continued there. At her last two visits the injections caused an almost immediate nausea and vomiting. She had become much weaker at this time and in the extremely nervous condition she was in the last day there followed some faintness with blueness of the lips and weak pulse. The encouraging results of this treatment were the immediate reduction in size of the sarcomatous mass, and temporarily the alleviation of pain. Dr. Turrill continued the treatment after her return home and wrote me that he had alternated the treatment in the nasal cavities and throat with .0025 mg. adrenalin daily, using .005 mg. but once, making seven injections only. The improvement was noticeable, and in about ten days she could blow the left nostril and breathe through the naris at times. Then she had become very weak, with considerable gastric disturbance and vomiting, due she believed to a remedy she was still taking. This was now discontinued. The fauces became inflamed and swollen, but there was no visible increase in the size of the tumor and no necrosis of tissue. A spray of adrenalin relieved the throat symptoms. An attack of diarrhea still further weakened her, but this soon subsided. The treatment was discontinued. The fearful exhaustion due to the inroads of the disease persisted, notwithstanding every effort at nourishment and stimulation, and the patient died March 15th.

While the results were encouraging only in this case, in view of the experience of Mahu by topical application and the notable improvement of the cases treated by Berdier and Falabert, I assume the method should be given a trial in other instances.

Mahu (*La Presse Medicale,* April 4, 1903) treated three patients with ulcerating epitheliomata by local applications of adrenalin (1-1000) and found it arrested persistent hemorrhage, suppressed the pain, and there followed a rapid and continued amelioration of the general condition of health. He did not claim curative effects, but in each case the neoplasm seemed to have been arrested in growth, for a time at least, and there was less tendency to spread and to invade new tissues. The disease in these cases respectively involved the tongue, the larynx, and the laryngeal vestibule. He suggests in conclusion that attempts be made to destroy circumscribed epitheliomata by adrenalin injections.

Berdier and Falabert (*La Escuela de Medicina,* Tomo XX, Num. 24, Dec. 31, 1905) report a series of nine cases of cancer, treated by subcutaneous injections of adrenalin in the internal ones, and interstitial injections in the external ones. The cases are reported at length. The first was one of cancer of the rhinopharynx.

The man was fifty-two years of age. He had no specific history and family history was negative. He was well until July, 1902, when he had an attack of erysipelas. In February, 1903, be began to have severe pain in swallowing and intense headache. The nasal passages became occluded. This continued about a month, when an eruption appeared about the nostrils, and there was a foul, sanious discharge from the nose. In June he consulted several specialists, who pronounced his case cancer of the rhinopharynx and gave a grave prognosis. Later some portions of the growth were removed. He was finally sent to Dr. Berdier for more radical treatment, in June, 1904. At this time the isthmus of the fauces was very much deformed; the palate very tense. hard, infiltrated, lustrous; the anterior pillar on the right side in a similar condition extending forward into the buccal cavity, where there was a vegetating mass, irregular in form, covered with a false membrane, gray, adherent, and of a very fetid odor. Posterior rhinoscopy was impossible, but on palpation there was found a hard, irregular mass in the nasopharynx, bleeding easily. The anterior nares were free, save a slight thickening of the mucous membrane, Dysphagia was marked and there was difficulty of respiration. The mucous membranes were pallid. The submaxillary glands were enlarged and hard, and there was enlargement of the axillary and inguinal glands, also. He had had thorough antispecific treatment over an extended period, without benefit. Topical applications of lactic acid, potassium chlorate, and various other remedies were also tried, but internal remedies were suspended on account of their irritation of the stomach. An appli-

cation containing cocaine 1 to 30 was applied and a gargle of chloral 1 to 200 was used and also enemas of peptones. On June 29th there was some improvement, less odor; he could breathe a little through the nose and pain was less and at greater intervals. The thermocautery was used at this time on the oral growths. This improvement was of short duration, and the patient soon became worse. July 10th he applied adrenalin, 1-1000, topically to blanch the exuberant masses and reduce the growth. This gave some relief till August 24th, when the condition of the patient was so bad that respiration was labored and stertorous; articulation difficult, as was deglutition also, even of liquids, from increase of the growth and glandular enlargement. Tracheotomy was advised but deferred on recommendation of Falabert, called in consultation, and interstitial injections of one-half milligram of adrenalin begun at irregular intervals of a day or two. In a few days the glands of the neck began to diminish, the patient could open the mouth and began to articulate better, some of the enlarged glands having disappeared after the eighth injection. On September 12th the conditions had changed remarkably. The soft palate had regained its elasticity and motility, the isthmus of the fauces presented an almost normal appearance, the thickness of the mucous membranes had diminished, there was less disturbance in mastication, and the patient could speak more plainly. The axillary and other glands had diminished very noticeably in size. On September 23d a marked gain in weight was noted. In April the weight was sixty-eight kilograms and this had declined to forty-six in September and increased to fifty-six under the treatment. The patient was reported in good health at the time of the presentation of the paper.

It is unfortunate that a histological examination was not made in this case, but it was seen by a number of the best specialists and they agreed as to the diagnosis. The other cases were cancer of the esophagus; three of cancer of the stomach, one of which was confirmed by a post mortem; one of epithelioma of the uterine neck; one of epithelioma of the skin; and two of the tongue and mouth. In each of these cases improvement in a marked degree is noted, evidenced by lessening in volume of glands involved, decrease in size of tumors, marked amelioration of pain, increase in weight and general improvement in health.

They conclude that when adrenalin is locally applied or injected it has a great influence on cancerous growths and they advise its use in all cases of cancer, and think it should largely replace morphine as an analgesic.

No satisfactory explanation can yet be given of the physiologi-

cal action of the adrenalin in cases of such pathological change as occurs in cancer and the subject has never been thoroughly studied. Elliott (*Journal of Physiology*, V. 32) has made many and valuable observations of the effects of adrenalin on animals. In his exhaustive treatise he shows that it accelerates and augments the heart beat, as do the cardiac accelerator nerves, and that it constricts the blood vessels of the body as do the sympathetic nerves is proven. Constriction is produced in the largest arteries as well as in the arterioles. Another author states that he had found that in the area around the point of the injections the blood vessels were constricted. Vascular dilatation is probably not produced by it, and the veins seem not to be influenced. On local application to unsound flesh it blanches it quickly and briefly, being succeeded by venous hyperemia. Its application to plain muscle invariably is followed by contraction, no retraction and relaxation. Melzer and Auer ("Transactions of the Association of American Physicians," 1904), in their studies of the effects of injections of adrenalin in delaying the toxic effects of strychnia, concluded that in some way there was an impairment of absorption through the blood vessels by the tissues. They also found that the blood of adrenalin animals clotted more easily. They brought out also another interesting fact, that the suprarenal extract possessed the property of increasing tonicity of contractile tissues, which lasted the longer the less organized this tissue is, showing that the effect is not of short duration. In brief their theory is: "It causes an increase in tonicity of the contractile protoplasm of the endothelia of the blood capillaries and lymphatics. This increase in tonicity narrows the lumen of the pores and decreases the facility for the interchange between the blood and the tissue fluid."

It is certain to my mind that in some way the action of the adrenalin is expended largely on the vessels and the blood stream and thus cuts off the nutrition in these growths. At the same time it must have some specific action upon cancerous growths, if we accept the conclusions arrived at by the results in the cases reported by Berdier and Falabert, above referred to. Certain it is that under an interstitial injection there was an increasing shrinkage of the sarcoma I have reported, and there is no reason to think that this shrinkage would not have continued if the injections could have been employed longer. The evident increase

in physical strength and well being in other cases treated by this method would also tend to show that my patient's rapid decline had nothing to do with the treatment, but continued in spite of it, as is usual in such cases without treatment of any kind. ,

As this method is new and the action of adrenalin when injected over a long period, and frequently, is not yet thoroughly understood, I believe it will be necessary to be cautious in its administration.

Joseph L. Miller has, within the past month, presented at the congress of American Physicians at Washington an admirable study of the production of arteriosclerosis by the continued administration of adrenalin. In a personal note he has given me briefly his conclusions as follows:

Josue, in 1903, first demonstrated that repeated intravenous injections of adrenalin chloride would produce in rabbits marked degeneration and calcification of the media of the aorta. It is quite remarkable how rapidly these vascular changes may occur, even in as short a time as five or six days or after three to four injections. A few observers have succeeded in producing these same changes by the subcutaneous use of adrenalin and by injecting it into the trachea. The question then arises whether this is a safe remedy when used subcutaneously in man. We know that when given in this way it causes a considerable rise in blood pressure, and this has been considered as an important factor in the arterial changes. Since it has been shown that digalen when administered intravenously to rabbits may cause arterial changes of similar character, it is probably safe to say that adrenalin is not more dangerous than some other drugs in common use. Of considerable interest is the recent work of Korany, who found that after injecting the animal with iodopin the adrenalin did not produce any change in the vessel.

Elliott found that the daily repetition of small amounts in animals experimented on causes atheroma of the aorta and coronary arteries. The remedy, however, is non-cumulative in action. Would we encounter a like condition in man and should precaution be necessary? The dosage would have everything to do with such a possibility. The experiments by different observers undoubtedly show that calcification of the media of the aorta and degenerative changes in blood vessels can be produced by injec-

tions of adrenalin. It must not be forgotten, however, that the dosage necessary to produce these changes in the animal must be comparatively very large, increasing from about three minims to each kilogram of weight in the rabbit. Rabbits of 2000 gm. have been killed in two and one-half hours by 20 mg. of pure adrenalin. Smaller doses do not produce these atheromatous changes. In human beings it would be necessary to use a proportionate dose—as 180 minims of 1-1000 solution for one weighing 60 kilograms—very many times larger than it would be considered safe to use or than would be recommended. There is no doubt, therefore, that the production of an arteriosclerosis in man would be a danger that practically does not exist. A careful histological examination of the tissues being treated should be made, as it has not yet been demonstrated what the changes in pathological structures at the site of injection have been. I unfortunately did not have my patient under observation long enough to permit such examination, but in other cases I trust it will be made. The unpleasant effects of the amount I used may have been due to the rapidity of the injection, and possibly the size of the dose. Melzer found the toxic effects of injections of bile much influenced by the rapidity with which they were made and that the rapid injection of a small quantity may have a fatal effect, while a much larger dose could be given slowly without such result. I think this precaution would be well in the use of adrenalin. Death comes speedily in animals from the injections of large quantities of adrenalin, and smaller quantities have provoked glycosuria and inflammatory changes in the liver and kidneys. Symptoms of weakness, prostration, nausea, and vomiting may have been evidence that too large a dose was used. I believe 2½ mg. is a safe dose for an injection and possibly 5 mg. is not too large in some cases. The nausea and vomiting, while not severe or prolonged in my case, seemed to be an indication for a smaller dose. I would, therefore, recommend only one milligram every two or three days, as initial dosage for an adult in most cases, with a possible cautious increase.

In conclusion, it seems to me that this method merits trial, especially in carcinomata and sarcomata of the throat and nose, where an unfavorable prognosis must almost without exception be made, and the earlier it can be resorted to the better. I believe

it may be safely asserted that it may replace morphine as an analgesic in these cases and that it has a palliative effect, while we have no proof of its being curative in its action as yet. In operable cases, however, where delay would be dangerous, a resort to surgery, as heretofore, should be the rule, until the matter has had further trial.

Discussion.

DR. C. F. THEISEN.—I have not had any experience myself with the use of adrenalin in that way, but the pathologist at the Bender Laboratory in Albany has succeeded in producing experimentally in rabbits fibrous myocarditis by these injections of adrenalin. It is quite in line with the work that Dr. Rhodes spoke of in his paper, of the changes in the vessels, particularly the aorta, and of course it is possible that degenerative processes would be produced in malignant tumors. Dr. Rhodes' paper is important because it brings out the possibilities of adrenalin, which we seem to be just beginning to find out.

DR. PRICE-BROWN.—I am very much interested in this paper by Dr. Rhodes. Although I had no idea that the application of adrenalin had a curative effect on sarcoma, I have for several years been struck by its seemingly prolonged influence in checking the circulation during operative treatment of sarcoma. In my experience in ordinary surgery of the nose in which cutting operations are done, adrenalin has an excellent effect at the time, with the danger of subsequent reaction; while in sarcoma it is the opposite. I reported a case of sarcoma of the nose and nasopharynx three years ago, and again one year ago to this Association, in which the operations were done by electrocautery, and in which I was much aided by the use of adrenalin. In this case hemorrhage never occurred after the patient left the office, something possibly due to the prolonged hemostatic effect of the adrenalin. It seems to me that Dr. Rhodes' idea is a good one.

With regard to injury to the system from its use, I may say that I have used it a large number of times in sarcoma, and in no case has it been followed by any injurious effect.

The patient that I reported has for many months been quite well. He is doing his work, and there is no return of the disease, and I think that the adrenalin may have had something to do with the favorable result.

My opinion is that for sarcoma of the nose we have no instrument equal to the electrocautery and no drug superior to adrenalin.

DR. D. BRYSON DELAVAN.—The suggestion made by the writer of this paper is interesting. Many active substances injected into

sarcoma by means of which the blood supply may be cut off have produced good results in the treatment of these cases, but the use of adrenalin seems to offer some advantages which heretofore have not been realized. There is one point referred to by the last speaker which is germane to the subject of the paper and that is the aftereffects of adrenalin upon the blood vessels. Of course is used in the manner brought forward by the reader of the paper, even if the effect of the adrenalin were temporary and if no great reaction should result, beneficial results might be attained, but the statement so often made by others that the use of adrenalin is followed by a congestive reaction is not sustained by any experiments thus far brought forth. The idea is prevalent that in the general use of adrenalin, if we apply it as commonly given, the blood vessels first contract. Following this contraction, a reaction takes place in which the vessels become congested. While this may be true of cocaine, I have yet to find it is true of adrenalin. Within the past year I have made some efforts to discover the answer to this question. In communication with Professor Abell of the Johns Hopkins University I learn that some experiments have been made in his laboratory upon animals and that reaction had not been found to take place; that is, the alleged dilatation of the vessels consequent upon the secondary effects of the adrenalin had not been observed. We have not yet any clear physiological laboratory evidence that secondary reaction does take place. As far as the evidence goes it does not take place. Clinically speaking, the reports of hemorrhage after the use of adrenalin have been to my mind entirely inconclusive. Bleeding occurs in a certain number of cases anyway, and whether adrenalin has any effect positive in increasing it does not seem to have been proved. We are under obligation to Dr. Rhodes for this paper. It is desirable that we come to some conclusion as to the real physiological action of adrenalin. My own opinion is that there is very little reaction after its use.

Dr. Otto T. Freer.—My excuse for entering the discussion of Dr. Rhodes' paper is the fact that he kindly permitted me to see his patient, and I can confirm the great accuracy of his description. I think this paper is of the greatest importance, because it offers at least a chance to cure these very hopeless conditions. Sarcoma of the nasopharynx I have encountered quite a number of times. One patient I treated by ligation of both external carotid arteries, followed by as thorough a removal of the extensive growth as was possible. Nevertheless it promptly returned, although the shutting off of the circulation alone, as suggested by Dawbarn, should at least put off a relapse for some time. Sarcomata such as that of Dr. Rhodes' patient have seemed to me to usually start in the vestiges of lymphatic adenoid tissue. They are very malignant and are usually prompt of recurrence when removed. It seems to

me that theoretically the adrenalin treatment should be more effective for sarcoma than carcinoma.

Dr. E. Fletcher Ingals.—While I have had no experience with adrenalin, I have had considerable experience with lactic acid, that makes me feel like controverting Dr. Brown's statement that the adrenalin and the galvano-cautery are the best things to be used. The galvano-cautery in such cases has been extremely unsatisfactory to me, but the lactic acid has been very satisfactory in at least two cases, both presenting the history and appearance of Maragliano (published in *Gazzetta degli Ospedali*, Milan, microscopic examination. In growths in the nasopharynx I have in many cases had most excellent results from the use of lactic acid, beginning with about 15 per cent. and running it up not higher than 35 per cent., injecting 15 or 20 minims once in from ten to thirty days. A 35 per cent. solution will cause sloughing, whereas less than that has not done so in my experience. In several inoperable cases the growth has been entirely removed in this manner.

Dr. Norval H. Pierce.—The question of great interest I think is that of the influence of adrenalin on inflammation. Without going into the details of the experiments which have been done, I would say that after the use of adrenalin, either locally on mucous membrane or by subcutaneous injection, it was found that the effects of staphylococcus and streptococcus were greatly augmented; abscesses were formed by greatly attenuated cultures, and the systemic effects were very much more marked. It would seem, in view of these experiments and the clinical observations of Maragliano (published in *Gazzetta degli Ospedali*, Milan, XXV, No. 152), adrenalin, in purely inflammatory conditions, should be used with great caution.

Dr. Rhodes.—I do not wish to occupy time in saying anything further. I presented this one case with some hesitancy, for, as it was only one, and, being recent, I have had no opportunity of using the remedy again for this purpose. I should certainly have to use it now if the opportunity presented itself, from the encouraging result in reducing the size of the tumor in this one case. The literature is scanty, but the assertions with reference to the curative effects of the drug seem worthy of credence, and I thought it was at least worth while for us to know as much as possible about the effect of adrenalin in these cases. A great deal of study has been and is being given to adrenalin at the present time by physiologists, but the experiments are almost entirely upon animals. What the clinical effects of the drug and the ultimate results are is not known as yet, but by using it constantly the more light we shall get on the subject and the better we will be prepared for its use in proper cases.

THE EXAMINATION OF THE THROAT IN CHRONIC SYSTEMIC INFECTIONS.

BY J. L. GOODALE, M.D.

THE object of the following paper is to present suggestions for examination of the throat which I have found of value in conditions of chronic systemic infection. With the more general recognition on the part of the general practitioner of the importance of the throat as an entrance point of infection, aid is more and more frequently sought of the laryngologist, in order to determine whether, in a given case, he can throw light upon the cause or origin of the general process. In the past twelve years, I find from a review of hospital and private practice that the largest number of such consultations relates to cases of cervical adenitis. Within the last year many consultations have been held with orthopedic surgeons in cases of chronic arthritis. The question always asked is, Does the throat account for the enlarged glands or is the throat the point of entrance for the infection of the joints?

In answering these interrogations we must look beyond the question of whether the throat exhibits alterations visible to the eye. We must bear in mind both the normal and pathological histology of the parts, as well as the nature of the special infection in question. We must distinguish between penetration of microorganisms through the tissues of the throat and the absorption of toxins. In short, we must base our opinion not only upon minute and painstaking examination of the case in question, but also upon an intelligent application of the related data in physiology and pathology.

Although a variety of infections probably enter the system through the throat, yet I shall confine my remarks for the present to tuberculosis of the lymph nodes and to infectious arthritis. In the study of the former infection the investigator is fortunate in possessing knowledge of the causative agent. If, therefore, we are able to follow here with accuracy the phenomena involved,

we shall have a point of departure for the study of other diseases where the cause and nature of the infection are less clear.

In studying the condition which the orthopedic surgeon terms infectious arthritis the investigator starts seriously handicapped. While clinical evidence appears to show that a state of infection exists, yet we do not know what the micro-organism is, or whether the disease is due to the actual penetration of bacteria into the body or to an absorption of their products into the system. Nevertheless, experience has repeatedly shown that the discovery and removal of a septic focus in this affection have been followed by more or less complete relief to the joint symptoms. Since the condition bids fair in the future to engross the attention of the laryngologist with increasing frequency, it behooves him to have as clearly as possible in mind what conditions of the throat are likely to constitute an infection atrium.

With regard, in the first place, to cervical lymphadenitis, the laryngologist has to determine whether the exciting cause is tuberculosis or some other irritant. I shall report briefly nine cases of this affection, where it was possible to study with comparative fulness the pathology and course.

CASE I.—A boy, 5 years of age, seen April 2, 1904, in consultation with Dr. T. M. Rotch, had shown one year previously enlargement of the cervical nodes on the left side, subsequently diminishing. During the past month several of the nodes again became enlarged on the same side, the largest reaching the size of a hickory nut.

Examination of the throat showed tonsils of normal contour and color, not enlarged or adherent to the pillars. The crypts presented no dilatation, and showed no evidence of retention of contents. A small, non-obstructive, pharyngeal tonsil was present. Under ether both tonsils and the adenoid were removed. The left tonsil on incision showed a central collection of puriform material in a cystlike cavity. Within a few days the cervical glands on the left side became larger and were removed by Dr. John Dane.

The adenoid and left tonsil were examined microscopically by Dr. J. H. Wright, and inoculation made into guinea-pigs. The adenoid showed no evidence of tuberculosis under the microscope and inoculation into a guinea-pig was not followed by tuberculosis. The tonsil showed giant cells and tubercles microscopically. Inoculation into a guinea-pig was followed by tuberculosis of the spleen and lymphatic glands.

In January, 1906, the child was again seen. Since the operation

he had been perfectly well, without a return of the cervical adenitis until three weeks ago, when a small mass appeared near the scar on the left, soft and elastic. Examination of the throat showed no sign of the left tonsil. Some small granules were visible on the posterior pharyngeal wall, and a certain amount of lymphoid tissue was found at the site of the right tonsil. The cervical nodes on the left were removed and found to be tubercular.

CASE II.—Girl, 2 years of age, seen with Dr. Rotch, February 23, 1904. For the previous three weeks, elevations of temperature occurred every afternoon from 100 to 101, accompanied by gradual enlargement of nodes under left jaw. The child was fairly well developed and nourished. Several cervical nodes were found on the left, the largest being the size of a hickory nut, the others about the size of a pea. The left tonsil showed moderate enlargement, with marked dilatation of the crypts and evidence of recent rapid proliferation, characterized by irregular mammillated surface, with here and there protruding digitations of lymphoid tissue. The right tonsil was smaller and presented nothing abnormal. Both tonsils and considerable adenoid were removed.

After this operation the temperature continued to run irregularly, and the cervical nodes on the left were removed by Dr. Dane in about two weeks. Several weeks later other nodes on the left enlarged and were removed. Since then the child continued to improve in every way, and remained well until May 1, 1906, when again the temperature exhibited afternoon elevations to 100 and 101 and two pea-sized nodules appeared near scar on left side of neck. Examination of the throat now shows no evidence of lymphoid tissue at the site of the left tonsil, and in other respects presents nothing to account for the adenitis.

The tonsils and adenoid were sent to Dr. J. H. Wright for examination. Tubercles and giant cells with bacilli of tuberculosis were found microscopically in the left tonsil and in the adenoid. Inoculation of a guinea-pig with the tonsil was followed by emaciation and development of tuberculosis over the peritoneum and in the retroperitoneal and mediastinal lymph nodes and the spleen. The lymph nodes of the neck showed typical tuberculosis, and a guinea-pig inoculated with the caseous material from one of the nodes was killed six weeks later and showed tuberculosis of the lymph nodes.

CASE III.—Child 6 years of age, was seen March 7, 1905, with Dr. McKean, for cervical adenitis, and showed a large adenoid, with hypertrophy of both tonsils. Several cervical nodes on the right were enlarged, the largest being the size of an English walnut. Clinical examination of the tonsils presented nothing beyond simple hypertrophy. The crypts were not enlarged, and there was no evidence of retention in the crypts. The tonsils and adenoid were removed and inoculated into guinea-pigs. The animals inoc-

ulated with tissue from the adenoid and left tonsil were found healthy when examined six weeks later, while the pig inoculated from the right tonsil showed extensive tuberculosis.

CASE IV.—Boy, 5 years old, seen May 18, 1904, with Dr. W. J. Donahue, for right cervical adenitis, several months' duration. Child fairly well developed and nourished; cervical glands on the right enlarged to size of Lima bean; tonsils apparently normal; moderate adenoid. On operation the right tonsil showed considerable cheesy material in the center; the left tonsil and adenoid presented nothing abnormal. In September of the same year the child was seen, and showed a clean, normal-looking throat, with slight diminution in the size of the nodes.

The right tonsil was sent to Dr. J. H. Wright for examination. Microscopical examination showed giant cells and tubercles. Portions of the tissue were inoculated in a guinea-pig, which was killed five weeks later, and showed tuberculosis of the retroperitoneal and mediastinal nodes, the spleen, the inguinal, and one axillary node. Tubercle bacilli were demonstrated in one of the lymph nodes.

CASE V.—Boy, 5 years of age, seen April 23, 1904, with Dr. L. F. Vickery, for right cervical adenitis of two months' duration. The tonsils were slightly enlarged and adherent to the pillars, but otherwise presented nothing abnormal. A moderate adenoid was present. Both tonsils and adenoid were removed.

The specimens were sent to Dr. J. H. Wright for microscopical examination. A guinea-pig was inoculated from the right tonsil and killed six weeks later, showing tuberculosis of the lymph nodes, of the spleen, and of the liver. The guinea-pigs inoculated from the adenoid and left tonsil did not develop tuberculosis.

One month later the cervical nodes became slightly smaller and continued during the next year to decrease in size. The child remained well until April, 1906, when a single node on the right appeared, rapidly enlarged, and showed central softening. Examination of the throat showed no evidence of hypertrophied lymphoid tissue at the former site of the tonsils, and nothing otherwise abnormal to account for the enlargement of the node. The general condition of the child was excellent.

CASE VI.—Girl, 2 years, seen December 5, 1904, with Dr. Rotch, showed moderate enlargement of the tonsils and adenoid, with slight swelling of the cervical nodes on the left, the largest being about the size of a small pea. No operation was advised at the time, but during the following winter the child had several severe colds, with increase in the size of the tonsils and of the adenoid, the cervical nodes remaining about the same. Except for a moderate hypertrophy of the tonsils, there was no abnormality noted on clinical inspection, there being no dilatation of the crypts or evidence of lacunar retention. The right tonsil and adenoid

tissue were sent to Dr. Wright, who reported on May 23d as follows:

"The guinea-pig inoculated March 11th with a portion of a tonsil received that day was killed to-day, May 23d, and shows extensive tuberculosis, obviously originating from the point of inoculation. The guinea-pig inoculated with the adenoid tissue fails to show tuberculosis. Microscopical examination of sections of the tonsil and adenoid does not show tuberculosis."

CASE VII.—Boy, 4 years of age, seen with Dr. C. P. Putnam, January 15, 1906, for right cervical adenitis of four weeks' duration, without other symptoms. The child was well developed and nourished. There was a moderate adenoid. The tonsils were moderately enlarged, but showed otherwise nothing abnormal, there being no dilatation of the crypts or acute inflammation. Three cervical nodes on the right side were enlarged to the size of a hickory nut. No change was noted during the following week, and the tonsils and adenoid were then removed.

Histological examination by Dr. Wright showed one tubercle in a section from the right tonsil, none in the left tonsil or adenoid. The right tonsil and adenoid were inoculated into guinea-pigs. Six weeks later the pig inoculated from the right tonsil was killed and showed extensive tuberculosis of the inguinal lymph nodes and spleen. The animal inoculated from the adenoid showed no tuberculosis.

CASE VIII.—A boy 7 years of age was seen November 13, 1905, with Dr. A. H. Wentworth for left cervical adenitis of two weeks' duration, following acute tonsillitis. The node was about the size of a pigeon's egg, firm and not tender. The tonsils were markedly enlarged, with dilated crypts, containing considerable puriform detritus. The acute tonsillitis had entirely disappeared. One week later examination showed no alteration in the tonsils or in the node. Both tonsils and considerable adenoid were removed.

Dr. Wright reported simple hyperplasia of the tonsils and of the adenoid. Guinea-pigs inoculated from these organs failed later to develop tuberculosis.

On the day following the operation the cervical node was smaller, and in two weeks had disappeared from palpation.

CASE IX.—A girl, 9 years of age, was seen March 7, 1904, with Drs. Rotch and F. B. Harrington, for left cervical adenitis of four days' duration, associated with reddening and swelling of the tonsils. The cervical nodes were about the size of a hickory nut. On the following day the tonsils were more swollen and redder, and showed a white spot on the right one at the orifice of a crypt. Cultures from this showed streptococci but no bacilli of diphtheria. The cervical nodes simultaneously became larger and more tender. Three days later the acute inflammation of the tonsils had disappeared, although these organs remained consider-

ably larger than normal. Nevertheless the cervical nodes continued to enlarge, and this time had attained the size of an English walnut. The tonsils and a small amount of adenoid were removed. In two days the lymph nodes began to diminish in size, and within two weeks could not be palpated.

Microscopic examination of the tonsils by Dr. Wright showed simple hyperplasia. No tuberculosis was found in guinea-pigs inoculated with material from the tonsils and adenoid.

These cases therefore demonstrate first that tubercular cervical adenitis may exist in association with the presence of tubercle bacilli in the tonsils, with or without visible changes in these structures, and is not necessarily affected by the removal of the tonsils; second, that a form of cervical adenitis occurs, accompanied by distinct enlargement and subacute or chronic inflammation of the tonsils, and disappears after their excision. In the first instance, it appears reasonable to assume that a penetration of tubercle bacilli through the tonsils into the lymph glands has occurred; in the second, that an absorption of irritating material generated in the tonsils is taking place from them into the adjacent lymph nodes. In the latter instance, the removal of the focus of toxin production is followed by immediate relief.

Theobald Smith has shown that in cattle the bacilli of tuberculosis may enter the system through the mucous membrane of the mouth or throat, into the associated lymph nodes, without leaving any traces visible to the naked eye or discoverable by manipulation.

In seeking now to discover in what manner this penetration takes place we turn naturally to the experiments which have been made with regard to the behavior of foreign substances in contact with the epithelium of the tonsils. It is sufficiently established that a penetration of dust and similar inanimate matter is continually taking place through the lacunar epithelium. It has not, however, been shown that such a penetration can take place through the relatively stout epithelium of the pharynx, and indeed microscopic inspection of the closely appressed cells in these regions renders such an occurrence improbable. Whether the penetration of inanimate matter can take place through the lymph follicles of the pharynx is not determined, but at least one inhibiting factor may be mentioned, namely, the constant irrigation of these structures by the fluids of the mouth during deglutition,

which will prevent a given particle of dust from remaining long over the intercellular spaces of the epithelium. This factor likewise exists in the case of the lingual tonsil, with its short, straight, and relatively wide lacunæ.

Although on theoretical grounds such an absorption is not likely to occur through the follicles of the pharynx or of the lingual tonsil, nevertheless, clinically, we know that at times, though rarely, certain micro-organisms may invade these structures, apparently in a primary manner. These infections appear to be due chiefly to streptococci, and give rise to acute inflammation of the follicles of the pharynx or of the lingual tonsil. I do not know that primary infection of these structures by the bacilli of tuberculosis has been recorded, although secondarily, where the vitality of the mucous membranes has been greatly depreciated, such lesions are not uncommon.

Our knowledge in regard to the behavior of dust on the lymphoid tissue of the nasopharynx is less complete than in the case of the faucial tonsils, but by analogy there would seem to be no reason why the same phenomena should not occur, in spite of certain differences which immediately suggest themselves, such as the relative paucity of micro-organisms, the dependent position of the lymphoid tissue, and the shape of the lacunæ, which do not favor retention of foreign substances, and the small amount and different composition of the irrigating fluid. It does not, however, seem necessary to consider the pharyngeal tonsil separately and we may, therefore, omit it for the present from consideration.

Returning now to the faucial tonsils, observation shows that bacteria, while numerous in the crypts, are not ordinarily found below the surface of the lining epithelium, being apparently arrested by some agency which prevents their penetration. Whatever the nature of this agency, it is undoubtedly at times suspended, as I have shown in acute cases of tonsillitis, with the result of producing infection within the follicles or suppuration of the circumtonsillar space. It seems reasonable to assume that bacteria, if they enter at all, will enter by the same path which inanimate matter has found most easy, namely, through the lacunar epithelium, rather than through the more impervious membrane in the vicinity. Furthermore, the crypts of the tonsils constitute more or less sheltered harbors, where bacteria may linger, unaffected by the stream flowing past outside their orifices.

On the foregoing hypothesis it is evident that, other things being equal, bacterial infection through the throat would be favored by an increase in the size and number of the intercellular spaces of the lacunar epithelium and by the retention of the contents of crypts. We have now to consider under what circumstances such favorable conditions for infection may be found.

With regard, first, to the character of the lacunar epithelium, examination shows that the number of the intercellular spaces is proportionate to the amount of emigration of lymphoid elements from the follicles. Since such an emigration stands directly in relation to the proliferation present in the tonsils, it is chiefly in tonsils undergoing rapid proliferation of their elements, or in those which have attained a considerable degree of hypertrophy, that a loose character of the epithelium is chiefly marked. It is therefore found mostly in the young, or in older individuals where proliferation is maintained by one cause or another.

On the other hand, as I have shown in studies on the retrograde changes of the faucial tonsils, where atrophy of the follicles is marked and proliferation correspondingly decreased the lacunar epithelium in the vicinity partakes much more of the stout, compact type covering the free surface of the organ. In other words, the tonsils under these circumstances would theoretically prove a more efficient barrier against penetration of foreign substances.

Retention of lacunar detritus and opportunity for the development of bacterial activity will naturally be afforded by a narrowing of the orifices of the crypts. Such constriction may take place as the result of cicatrical contraction arising from previous acute inflammation or by adhesion to the tonsillar folds or the pillars in the vicinity or by process of retrograde metamorphosis. If the occlusion of the orifice of the crypt is complete, a cystlike cavity will be formed. If this cavity is free from bacteria, it will exert no further influence upon the system, except possibly through pressure. If, however, the occlusion is not complete, but permits the entrance of micro-organisms, those which are saprophytic will effect a decomposition of the lacunar contents, while those of pathogenic property may be permitted to live, multiply, and await favorable opportunity for entering the system.

Such a condition of affairs may usually be perceived clinically by the presence of cheesy masses in the tonsillar crypts, or in the supratonsillar fossa, or between the tonsil and the pillars, espe-

cially the anterior pillar. These are seen microscopically to consist of desquamated epithelium, both living and dead leucocytes, bacteria, and at times even particles of food. Clinically this condition is characterized to a greater or less extent by evidences of toxic absorption into the system, as evidenced by pallor, impairment of strength and spirits, fetid odor of the breath, and gastric disturbances of various kinds. It is therefore probable that the two chief anatomical factors favoring infection may be found in the looseness of the lacunar epithelium, prior to retrograde metamorphosis of the follicles, and in the retention of lacunar detritus.

With these facts now in mind, we are in a better position to answer the question whether in a given case the throat is responsible for an infectious process elsewhere. It will be seen immediately that the average tonsil may be an entrance point for infection without essential deviation from the normal type, either in size or other pathological alterations. Our consideration must not only regard the strength or weakness of the supposed point of attack, but also the nature of the invader and the resistance on the part of the host.

Tubercular cervical adenitis is essentially a disease of the young, and, as these cases have shown, may enter any tonsil, even of normal appearance, provided the micro-organisms are present in the throat and suitable predisposition on the part of the host exists.

Non-tubercular cervical adenitis from absorption of toxins produced in the tonsils would theoretically be accompanied by visible alterations in the latter characteristic of lacunar retention. This occurred in Cases VIII and IX, and is confirmed by many instances which have come under my observation.

In chronic infectious arthritis, we have, as yet, but scanty data, and more will be eagerly awaited. If it be true that this affection is due to a specific micro-organism, it would seem probable that it is constantly about us, as in the case of other pathogenic micro-organisms. In this event it is possible that the bacterium may be more or less constantly present in the mouth, and that certain individuals are peculiarly susceptible to infection by it. On theoretical grounds it would seem more reasonable to assume that such predisposition is a primary factor in its causation, rather than that a certain state of the throat may permit of its development in any individual.

Given, however, systemic predisposition, local vulnerability would become of importance in determining an attack, and we are therefore impelled to seek for the place of diminished resistance. While the point of infection may occur in other regions than the throat, yet if these can be eliminated we should look carefully in the tonsils for such conditions as have been described.

Following out this line of thought we may say that the arthritic individual predisposed to rheumatic infection finds in the administration of certain remedies, or in the restriction of his diet, means for resisting infection, or in controlling the development of micro-organisms after admission. The examination of a large number of cases of infectious arthritis, with regard to the conditions of the throat, has demonstrated the existence of pathological alterations in the tonsil, characterized in general by retention of lacunar detritus, with or without hypertrophy of the organ. Since, however, inspection and careful clinical examination may fail to disclose deep-seated collections of detritus, communicating by circuitous passages with the open air, it seems to me wise, if other points of infection can be eliminated, to extirpate the tonsils in the most thorough manner. We shall thus replace a tissue of diminished resistance by a stout barrier of compact structure without nook or recess to harbor a pathogenic parasite.

THE ETIOLOGY OF HYPERKERATOSIS OF THE TONSILS.

BY GEORGE B. WOOD, M.D.

In the consideration of such a widely discussed subject as "Hyperkeratosis of the Tonsillar Tissues of the Throat" it is not necessary to review the great quantity of literature which has been written concerning it. I might, however, call attention to an article by Sendziak, published in the Transactions of the American L., R., and O. Society for 1905. In this article Sendziak carefully reviews the greater part of the literature from Fraenkel up to the writing of his article. His conclusions are in accord with the original idea of Fraenkel, namely, that a specific infection by the leptothrix is the important etiologic factor in the production of this peculiar condition of the tonsils. It seems to me most unfortunate that such a view of the etiology of hyperkeratosis of the tonsillar tissues has been so recently resurrected. I had thought that the idea of a specific relation between the leptothrix and this disease had been so firmly buried by Siebenmann and others that all thinking laryngologists had come to believe that the leptothrix was present purely as a saprophyte. There is a rather acute infection of the throat in which the leptothrix is probably the exciting cause. This infection, however, is not limited to the tonsillar tissues, but may occur in any portion of the body where the vital resistance has been lowered and the leptothrix organisms have gained access.

But because the leptothrix is a common inhabitant of the mouth the throat is more frequently infected than are the other portions of the body. The clinical picture of the infection, however, is absolutely different from hyperkeratosis of the tonsils. Any part of the throat may be infected. There is an acute inflammatory reaction, usually accompanied by a milky white membrane, which may or may not leave a denuded surface on being detached. Also there is very apt to be infection of the cervical

lymph glands. The condition is easily cured by the ordinary throat washes and runs an acute febrile course. I am, however, wandering from my subject.

Hyperkeratosis of the tonsillar tissues of the throat is a disease, or, better, a condition characterized by the appearance of numerous white projections, not only from the cryptal orifices of the tonsils proper, but also from the orifices of the lymph follicles on the posterior and lateral pharyngeal walls and on the lateral glossoepiglotidian folds. This condition does not occur on portions of the throat where there is no lymphoid tissue. The lymphoid tissue of the upper respiratory tract, however, is so ubiquitous that occasionally we may see these little white projections on almost any part of the mucosa. In the large majority of cases the condition is limited to the faucial and lingual tonsils. That it reaches its greatest development on the base of the tongue and at a position just behind the lateral glossoepiglotidian folds and the posterior part of the inferior poles of the tonsils is due, almost entirely, to mechanical reasons. The contractions of the muscles during swallowing prevent food from coming in intimate contact with the surface of these parts, and therefore permit the projections to grow undisturbed. Although the horny material is quite resistant to trauma, the bacterial accumulations which form the greater mass of the projections are easily brushed off, so that the size of the growth is much greater where it can be protected from mechanical disturbances.

The symptoms caused by this condition of the throat are either entirely wanting or very slight, and due for the greater part to the local irritation of the hard, horny plug. If they project from the base of the tongue so as to come in contact with the epiglottis there will probably be an irritating tickling sensation, causing a hacking cough. If they are so placed as to be compressed during the act of swallowing they may give rise to a slight sticking pain. Occasionally among the rich and varied bacterial flora which grows in such luxuriance on this horny material there may lurk a germ possessed of more or less pathogenic power which can set up an accompanying inflammatory reaction in the tonsil or surrounding structures. Hence the relation which some observers have noticed between acute tonsillitis and this disease.

To understand correctly the pathology and also the etiology of lacunar hyperkeratosis we must turn our attention for a few

moments to the anatomy of the normal active tonsil. The tonsil consists of four chief elements: the connective tissue, the germinating folicles, the interfollicular tissue, and the crypts.

First: The connective tissue—that is, the trabeculæ and the reticulum—acts as a supporting framework to the tonsil substance proper. The trabeculæ carry the blood vessels, the nerves and the lymphatics.

Second: The germinating follicles are the centers wherein the large mother cell of the leucocytic group undergoes karyokinesis and forms young lymphoid cells.

Third: The interfollicular tissue is made up of lymphoid cells in various stages of development. The cells making up this interfollicular tissue differ in size and shape according to their location. They are greater in number around the follicles, and show greater difference in their anatomical construction in the immediate neighborhood of the crypts.

Fourth: The crypt of the tonsil is its peculiar and most characteristic structure. It consists of an invagination of the epithelium from the surface of the tonsil, which has undergone a very interesting anatomical change. In the first place the subepithelial connective tissue which exists in a marked degree beneath the surface epithelium disappears as soon as the epithelium starts to form the crypts. This permits the epithelial cells to come in direct contact with the lymphatic structure of the tonsil and very frequently it is impossible to distinguish a dividing line between the epithelium of the crypt and the interfollicular tissue. The epithelium of the crypt, unlike its progenitor which covers the surface of the tonsil, does not form a compact unbroken barrier of protection. For the greater part of its extent it presents an intact line only one or two or possibly three cells in thickness. Toward the parenchyma the epithelial cells show a peculiar condition. They are separated from each other by interposed cells varying in type from slightly changed epithelial cells to a well-formed lymphocyte. Also the epithelial cells may extend from the crypt into the tonsillar substance, suggesting the ramifications of a malignant epithelioma. The smaller terminal invaginations of the cryptal epithelium are usually solid sprouts, frequently with central keratosed cores. The lumen of the crypt is formed by the subsequent exfoliation of the keratosed cells.

Turning now to hyperkeratosis, we find the epithelium of the crypts showing characteristic changes. In hyperkeratosis the epithelium loses its rarefied condition and becomes an ordinary pavement squamous epithelium similar to that covering the surface of the tonsil, except that generally it does not show the connective-tissue papillæ. The crypt of the tonsil is markedly

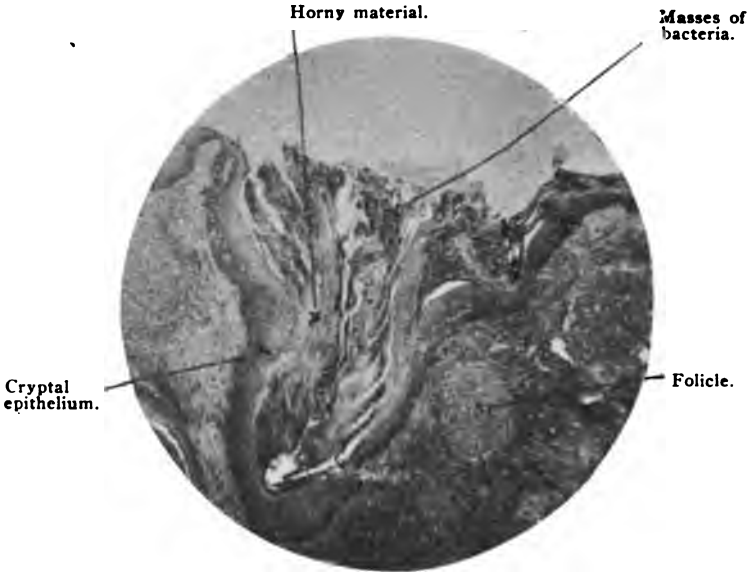


Fig. 1. Hyperkeratosis. Showing the typical appearance under low power. The horny mass is growing from a comparatively small area of the cryptal epithelium, and the plug shows the ordinary fraying of its edges.

dilated and filled with a horny mass, which merges at various points into the epithelium, though in sections stained with eosin and thionin there seems to be a more or less distinct line where the epithelial cells become keratosed. The living cell has a nucleus well stained with thionin, and its protoplasm is of a purplish color, due to the mixed staining with eosin and thionin. The keratosed material stains only with the eosin, and is therefore of a bright pink color. Occasionally in the keratoid mass a very faintly stained nucleus will be found, indicating that the material of which the mass consists has been originally derived from

epithelial cells. According to the mechanical circumstances by which the tonsil is surrounded, the horny mass becomes sooner or later broken up into layers between which multiply and grow organisms of all varieties. This fraying of the cryptal plug may take place within the crypt itself, so that the resulting fissures permit the bacteria at times to penetrate almost but not quite to

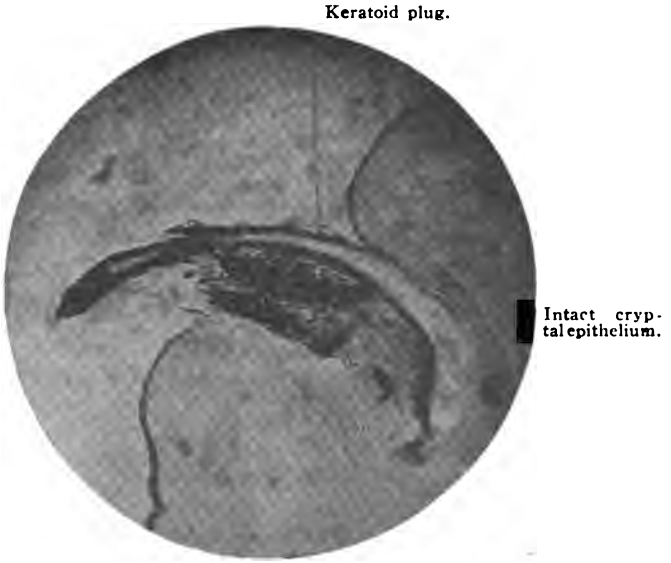


Fig. 2. Hyperkertosis, faucial tonsil. This specimen was from a case which had been vigorously treated with antiseptics. There are practically no micro-organisms. The black staining is due to nitrate of silver which had been used in treating the patient.

the living epithelium. Mitotic figures may be seen in the epithelium at different places, but especially along the border toward the parenchyma of the tonsil. The epithelium is, therefore, in a state of active growth. This eccentric growth, however, which results in the formation of the keratoid plug is not equally distributed to all parts of the epithelial lining of the tonsillar crypts. Take for instance a single individual crypt: a portion of the epithelium may still persist in its normal condition of partial disintegration without a discernible border line between it and the tonsil parenchyma; in another part the epithelium may exist simply as a barrier of cells with a very thin layer of subepithelial connective tissue, and

again in the same crypt we may see the hyperkeratosis in its most beautiful and characteristic appearance.

This change in the epithelium of the crypts is the characteristic pathologic feature of hyperkeratosis. Besides this there are generally other changes in the tonsil. The connective tissue is usually increased in amount, the trabeculæ are thicker and in

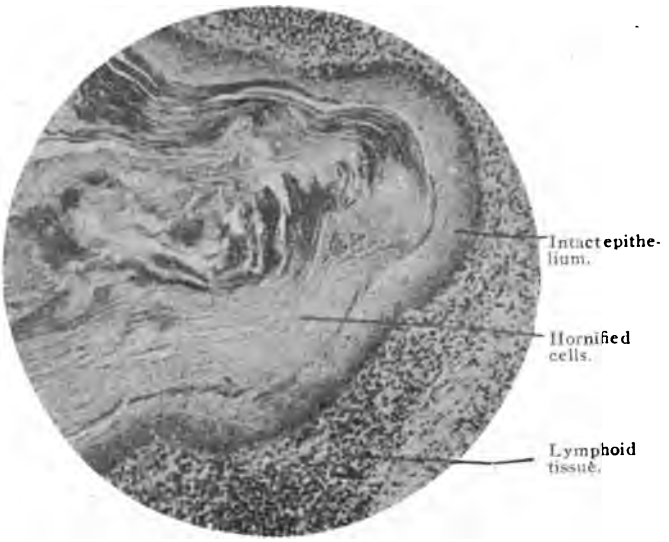


Fig 3. Hyperkeratosis. Cross-section of a crypt filled with keratoid material and bacteria.

some cases of the subepithelial connective tissue extends from the surface epithelium for quite a distance down along the crypt. The follices are small and much less numerous, and the surrounding zone of lymphocytes has become comparatively insignificant. The mitotic figures in the follicles, though present, are less numerous, and the whole aspect of the organ is one of suppressed activity. We find, however, sometimes signs of local irritation in the immediate neighborhood of the crypts, as evidenced by the outwandering of polymorphonuclear leucocytes from the capillaries and their penetration between the cells of the cryptal epithelium. This irritation is easy to understand when we consider that the crypts contain large numbers of saprophytic and probably also pathogenic micro-organisms growing actively and

receiving their nutriment from the accumulated keratosed cells. The toxins elaborated by these organisms must be absorbed to a greater or lesser extent by the tonsillar tissue. It is probably due to the fact that the cryptal epithelium has lost its normal physiologic disintegration and has become an impact protective barrier that a more noticeable reaction is not a common result.

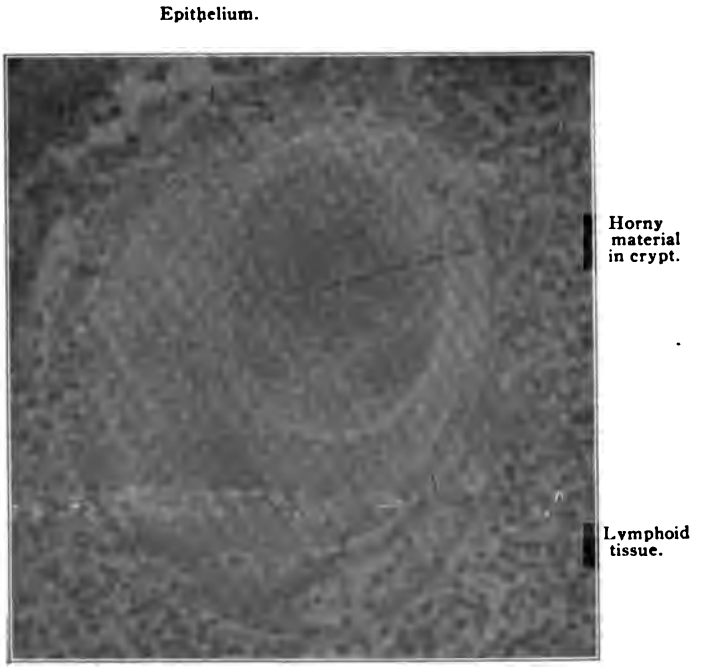


Fig. 4. Hyperkeratosis. Cross-section of the terminal portion of a crypt showing the concentric arrangement of the layers of horny material and the epithelium, which is still somewhat disintegrated.

In a paper published in 1904 on the "Functions of the Tonsil," I endeavored to show that the epithelium of the crypts was in a state of active growth and that the epithelial cells were undergoing a metamorphosis, the result of which was the formation of lymphoid cells. Since then further study on the subject has increased my belief in this theory, especially as I have been able to demonstrate that the cryptal epithelium of the normal tonsil shows a sufficient number of karyokinetic figures to indicate a rapid growth. At the time of the publication of my paper I did

not believe that the mitotic figures could be found in the epithelium of the deeper portions of the crypts, but other phenomena suggesting rapid increase were so noticeable that I concluded that the cells were undergoing amitotic division. Recently I have seen in undoubted epithelial cells numerous mitotic figures showing all the stages of karyokinesis. The phenomena which previously led to the belief that the epithelial cells of the crypts were in a state of active growth were the constant finding of keratosed and desquamated cells in the lumina of the crypts and the penetra-

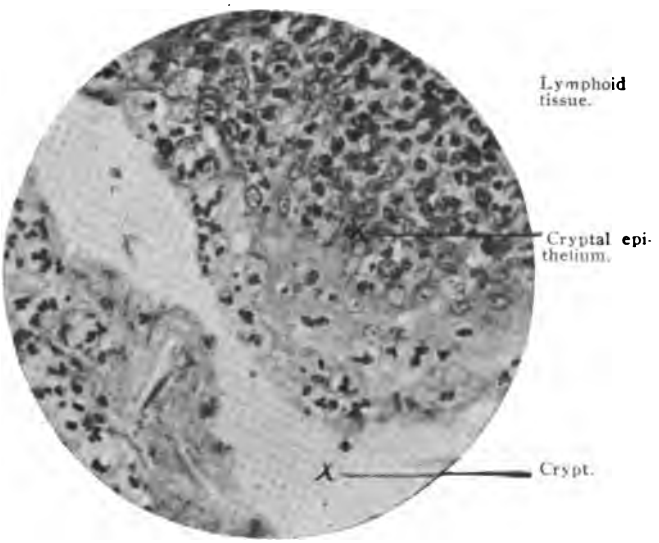


Fig. 5. Hyperkeratosis. The epithelium here represented still retains its normal rarification, though in other portions of this same crypt there was typical hyperkeratosis. Numerous polymorphonuclear leucocytes are passing through the epithelium.

tion of the deeper cells of the epithelium into the interfollicular tissue. In some forms of hypertrophied tonsils this penetration reaches such a high degree that the epithelium may almost completely surround some of the germinating follicles.

It is scarcely convenient in this paper to reiterate the various reasons why I thought the epithelium of the crypts of the tonsils was a primogenial source of lymphocytes, and it may be that until this metamorphosis can be proven as clearly as that one and one make two the majority of pathologists will be inclined to

doubt its possibility. For the purpose of this paper the proof of this metamorphosis is not absolutely necessary, but I desire to emphasize the fact, namely, that the cryptal epithelium in the normal and hypertrophied tonsil is for some reason or other in a state of active growth.

Several years ago I made the statement concerning the etiology of hyperkeratosis of the tonsillar crypts that the increased growth

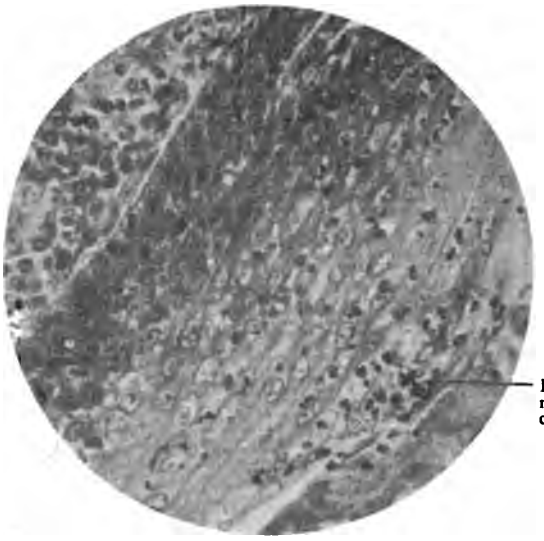


Fig 6. Hyperkeratosis. Showing polymorphonuclear leucocytes passing through the epithelium. This microphotograph shows the cryptal epithelium beginning to lose its physiologic activity.

of the epithelium forming the keratoid plug was probably due to a low-grade inflammatory condition of the tonsillar parenchyma. I based this erroneous idea on the following rather peculiar phenomenon. In the removal of a portion of a tonsil by an instrument, such as the tonsillotome or snare, which compresses the organ at the line of the separation, there will be found near the line of removal numerous elongated nuclei closely resembling leucocytes in an active state of diapedesis. At that time I believed that these compressed leucocytes were the result of some chemotactic attraction and hence indicative of inflammation. As there were no other inflammatory changes, I concluded that the inflammation must be of a low grade. Since that time I have

been convinced that these peculiar elongated cells are the direct result of mechanical compression either in the removal or handling of the specimen. On the other hand, the tonsils showing hyperkeratosis of the crypts are almost always small and more or less atrophied, and under the microscope show an increase in the connective tissue with a decrease of lymphoid tissue and secondary follicles, so that we have a picture of functional quietude.

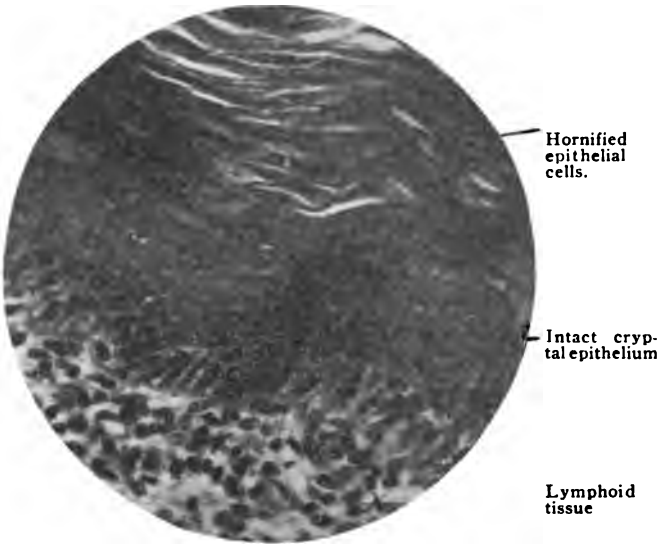


Fig 7. Hyperkeratosis. Section through the cryptal epithelium, showing the formation of the keratoid mass from the epithelial cells.

The functional activity of the tonsillar epithelium (permitting me to reiterate) is growth both superficially and internally. Now it is conceivable that if an organ with a peculiar physiologic growth manifested in two directions is for some reason deprived of its ability to increase centrally it may double its growth peripherally. In other words, supposing the cryptal epithelium has ceased to penetrate into the parenchyma of the tonsil, its tendency toward growth causes an increased output of superficial or keratosed cells. Again, the distintegration of the epithelium permits an outpouring from the tonsillar parenchyma of numerous leucocytes and probably more or less fluid secretions which, mingling with the accumulating epithelial cells, cause their dis-

integration and consequent exfoliation. When the physiologic activity of the epithelium has ceased, the epithelial cells revert to their original type and form an intact squamous pavement epithelium. The extravasation of leucocytes and fluids through this intact epithelium is difficult, and the growing superficial cells can accumulate in the crypt until a greater or smaller mass of keratoid material is formed.

This, then, is the *raison d'etre* of hyperkeratosis of the lacunæ of the tonsillar tissues of the throat: namely, a decreased functional activity of the tonsil while a portion of the cryptal epithelium still possesses its physiologic tendency toward growth.

It must be admitted that this theory is more or less open to criticism, because there are certain happenings regarding this peculiar condition which are somewhat difficult to harmonize. If this condition is due to descreased functional activity, why is it that tonsils generally atrophy without more manifestation of a hyperkeratosis? The vagaries of life are so great and so numerous that it is always easy to hide unexplainable phenomena under the cloak of life's mysteries, and I understand that in a scientific article one can scarcely be excused for seeking such a refuge. Such is the case, however, and I must be pardoned for being unable to explain why the epithelium of some tonsils retains a portion of its physiologic property while losing the remainder, just as I cannot explain why one individual is practically immune from smallpox while another is most susceptible. It may be that the influence of certain toxins, possibly of microbic origin, exerts just the proper amount of stimulation which the epithelium requires for increased growth, or it may be something else; but to me it seems much more probable that hyperkeratosis of the tonsillar crypts is a pure vagary of function on the part of the epithelium of the tonsillar lacunæ.

The facts and theories which have just been advanced would indicate the uselessness of any local treatment other than the destruction of the tonsillar crypt, and clinical experience bears out this view. Almost all of these cases, after a period varying from a few months to a year or more, tend to recover spontaneously. Further, the condition is generally seen at that time of life when the tonsils are atrophying and in a large majority of cases the size of the afflicted tonsil is already insignificant.

In conclusion I want to place particular emphasis upon the

importance of dissociating the leptothrix or any other microorganism from an etiologic relationship with lacunar hyperkeratosis of the tonsils. It would be as rational to hold the grime and dirt of a miner's hand responsible for the production of the horny layer of the skin as it would to believe that the saprophytic leptothrix is the causative element in the production of what is really a calloused tonsil.

Bibliography.

1. Fraenkel, B. Berl. klin. Wochnschr., 1873, p. 94.
2. Fraenkel, B. Zeitschr. f. klin. Med., iv, 1882, p. 288.
3. Gruning. Arch. f. Lar., No. 3, 1882.
4. Toeplitz. Ueber Pharyngomycosis leptothricia benigna. New Yorker Medical Presse, Dez. 1886, p. 13.
5. Vanderpoel. Pharyngeal mycosis. New York Med. Journal, Feb. 9, 1889, p. 147.
6. Heryng. Ztschr. f. klin. Med., vii, 188.
7. Jacobson. Volkmann's Samm. klin, Vortr., No. 317.
8. Miller, W. D. "Die Mikroorganism der Mundhohle," 1889.
9. Rice, C. C. Chronic inflammation of the tonsils caused by leptothrix buccalis. International Clinics, Oct., 1891, vol. iii, p. 343.
10. Spaans. Mycosis pharyngis leptothricia acuta. Brit. Med. Journal, Epit. of Lit., Feb. 13, 1892.
11. Dubler. Der Halsorgane von einem 8 monatlichen Knaben mit Leptothrixmycose des Larynx, Pharynx und Oesophagus. Correspondenzblatt f. Schweizeraerzte, Jahrg. xxii, 1892, p. 78.
12. Hemenway, H. B. Journ. of Lar., Rhin., and Otol., vol. vi, Feb., 1892, p. 53.
13. Semon. Mycosis pharyngis leptothricia and keratosis pharyngis. St. Thomas Hos. Reports, 1893, vol. xiii, p. 127.
14. Cheatham. Leptothrix mycosis of the tonsil, pharynx, and base of tongue. Am. Practitioner and News, May 20, 1893, 361.
15. Wroblewski. Beitrage zur Pathologie und Therapie der Zungentonsille. Wien. med. Presse, 1893, p. 174.
16. Grant and Wingrave. A case of pharyngomycosis. Journ. Lar., Rhin., and Otol., April, 1893, p. 174.
17. Seifert. Die Pathologie der Zungentonsille. Archiv. f. Lar. u. Rhin., 1893, Bd. i, p. 69.
18. Siebenmann. Archiv. f. Lar. u. Rhin., 11, 1894-5, p. 365.
19. Dunn. A case of mycosis of the pharyngeal tonsil. N. Y. Med. Jour., July 28, 1894, p. 112.
20. Ingals. Mycosis of the pharynx and tonsils. N. Y. Med. Jour., Sept. 1, 1894, p. 261.

21. Thomas, H. M. Pharyngomycosis. N. Y. Med. Rec., Jan. 6, 1894.
22. Glasgow, W. C. Mycosis of the pharynx. Cincinnati Medical Journal, Feb., 1894, p. 51.
23. Sendziak. Rev. de Laryngol., Par. 1894, xiv, 228.
24. Seifert, Otto, and M. Kahn. Atlas der Histopathologie der Nase, der Mundracleenhohle und des Kehlkopfes, 1895.
25. Lake, R. Tonsillar Mycosis. Jour. Lar., Rhin., and Otol., Feb., 1895, p. 164.
26. Wright, J. A. A few remarks on some cases of mycosis of the nose and throat. N. Y. Med. Journal, July 6, 1895, p. 1.
27. Kelly, A. B. Mycosis pharyngis leptothricia and keratosis pharyngis. Glasgow Med. Journal, No. 11, Aug., 1896.
28. Goodale. Journ. Boston Soc. Med. Sc., 1897, 8, 11, 204.
29. Wright, J. The Laryngoscope, lv-v, 1898, p. 221.
30. Wood, Geo. B. The pathogenesis of lacunar keratosis of the tonsil. U. of P. Med. Bull., Jan., 1902.
31. McKinney. A case of mycosis tonsillaris affecting both tonsils completely cured by removal of the tonsils by electrocautery dissection. Jour. Am. Assn., 1903, xi, 991.
32. Colwell, N. P. Mycosis pharyngis leptothricia and keratosis pharyngis. Illinois Med. Journal, Dec., 1903, p. 480.
33. Onodi and Entz. Ueber Keratosis pharyngis. Archiv. f. Lar. u. Rhin., 1904, xiv, p. 265.
34. Fricker. Zur Jodreaktion einiger Leptothrixarten der Mundhohle und des Magens. Centralbl. f. Bakteriol. u. Parasitenk., vol. 36, 1904.
35. Wood, Geo. B. The function of the tonsils. U. of P. Med. Bull., Oct., 1904.
36. Sendziak, John. The etiology and treatment of mycosis occurring in the upper respiratory tract. Transactions of the Eleventh Annual Meeting of the Amer. L., R., and O. Society, 1905, p. 307.

Discussions on the Papers of Drs. Goodale and Wood.

DR. GOODALE.—It does not seem wise to me to report cures of chronic infectious arthritis, because the time is too short and sufficient time has not elapsed. My experience has been so satisfactory, however, that I hope that you will, if you have not already done it, consult your orthopedic friends where possible, or urge them to take you into their confidence in examination of these conditions. It is very striking that after the removal of the septic foci in these cases there has been no return of the acute exacerbations of the disease, which in the past had been leading to deformity with atrophy of the joint structures. If you can check the absorption of infectious material you will give the orthopedic surgeon a chance to effect improvement.

DR. J. H. BRYAN.—In regard to the question raised by Dr. Goodale as to the tonsils being a source through which infection takes place in joint disease, I would say that I have recently had under my care a very interesting case, the patient being one of Dr. Goldthwaite's, of Boston. I was asked to look for some infection in the tonsils. It was only by careful search that I found considerable pus in the crypts under the anterior palatine folds. I there found three or four very deeply seated chronic follicular accumulations. I was asked to do this to see if these local tonsillar conditions had any influence upon the articular inflammation. Of course it is too soon to say what the result may be in this particular case, but I believe there is a great deal in this theory and it is very important that we should look to the tonsils as a source of infection for many of these articular inflammations.

DR. THOMAS HUBBARD.—Chronic endarteritis with valvular lesions becomes especially important in relation to tonsillar disease, for the condition is liable to seriously handicap the treatment of the source of recurrent infection. Anesthesia and shock of operation are to be avoided if possible, and yet the necessity for a radical operation on the tonsils (and adenoids) is all the more urgent by reason of the existence of endocarditis. In such cases we are compelled to fall back on the old-fashioned treatment of cleansing tonsillar crypts and operate in a period of absence of any degree of active inflammation.

In regard to hyperkeratosis, I would say that I have seen three instances of more than one case in a family—two of mother and daughter and one of sisters, all having hyperkeratosis with more or less mycosis. In all the horny epithelial masses were associated with mycelial deposits, but in view of the modern conception of this condition such instances should be regarded as coincidences.

DR. H. L. SWAIN.—I think that such papers as Dr. Goodale and Dr. Wood have read before this congress are most commendable. Dr. Goodale's relation of cases illustrates very beautifully and clearly the possibility of work and what may be demanded of us. I am particularly interested in this case where the external appearance of the tonsils was perfectly normal and where on removal he found this large cavity which was infected. It rather puts us in the predicament of not knowing whether we have healthy tonsils or not until you take them out and examine them. We evidently must take a different view of the situation when these cases are brought to us in consultation—I think a more serious view than has been our usual custom. It seems to me that notwithstanding our previous activity we may be obliged to do more work on tonsils than we have hitherto considered it right to do in the light of our previous knowledge.

The subject of hyperkeratosis as presented so ably by Dr. Wood is hard to discuss in a meeting of this kind. One needs to read it over thoroughly before he can appreciate the work that

has been done. His conclusions are certainly a very interesting contribution to the subject.

DR. EMIL MAYER.—As illustrating the value of Dr. Goodale's paper, I was called a short while ago, being asked to examine a young man who had several attacks of hemoptysis and whose family physician thought that the removal of tonsils, which seemed not to be extremely large, would benefit him in the sense of relieving him to a certain extent of throat irritation, as indicated by a short, hacking cough. I doubt whether I should, under ordinary circumstances, advise the removal of the tonsils in the condition they were in, but the family physician is a very careful observer and I felt that he knew what he was speaking of, especially as we had both gone very carefully some time ago into the question of infections as occurring through the tonsils. I removed this young man's tonsils, but before doing so loosened up the adhesion of the tonsil to the anterior pillar, and the moment the tonsil popped out there came with it a mass of cheesy matter that has been spoken of by Dr. Goodale, which I am sure was keeping up a great deal of constant irritation of this boy's throat. As a matter of fact, the removal of the tonsils stopped his cough at once. He has not coughed since, although he was operated on some three weeks ago, and his general condition has in that short time improved very much. But in this instance on account of the fact of his having a history or beginning history of tubercular clinical symptoms, I had both his tonsils and adenoid tissue examined by our pathologist, who reported an absence of any tubercular bacilli.

DR. WOOD.—Concerning the penetration of bacteria through the tonsil I would like to mention a few experiments with the tubercle bacilli. In an experiment on a hog I rubbed a virulent culture of tubercle bacilli gently over the surface of the tonsils and was able to find these germs in the subtonsillar lymph glands within five days after the inoculation. A portion of the gland injected into a guinea pig caused abdominal tuberculosis. By the microscpoe no change could be detected in either the tonsils or the lymph glands, and it would seem, therefore, that under certain circumstances virulent micro-organisms may pass through the tonsil without producing in that organ any reactive phenomena. The question, however, why certain organisms may pass through the tonsillar tissue and others may not is a most interesting one and as yet has not been solved. It may be that for certain germs there exists in the tonsillar tissue certain bacteriolytic ferments which destroy these organisms, while for other germs the tonsil possesses no such immunity.

DR. GOODALE.—The tonsil is only one of a large number of lymphatic structures in the rest of the body, and it would be important to ascertain whether such conditions as just described also exist in the follicles of the small intestine, in the lymphatic

structures of the throat in other regions, or whether it was simply a process peculiar to the crypts of the tonsil alone.

This paper on hyperkeratosis of the tonsils, as Dr. Swain says, is a difficult one to discuss, and I should feel obliged to read it before I could do it justice. I have been very much interested in it, and I have been exceedingly pleased to see the excellent photographs.

In closing the discussion with regard to the deductions to be drawn from an examination of the throat in cases of cervical adenitis, we may reduce the matter to this: When a case is examined we should first ascertain the possibility of infection through the teeth or scalp or other external source. In the absence of these causes we proceed to explore the tonsil. I have felt that the more healthy in appearance the tonsil is under such conditions the more likely is it to prove tubercular when the bacteriological examinations and inoculations are made, and, conversely, the worse it looks clinically the more favorable prognosis we may give.

Dr. Wood.—The instance of the family cited by Dr. Hubbard in which one member after another presented hyperkeratosis of the tonsils does not necessarily indicate that this condition is an infectious one. I believe that almost every individual passes through a stage in which it would be possible to find some trace of horny material in the tonsillar crypts. I have frequently seen such conditions in individuals who had no idea that they possessed anything out of the ordinary in their throats. For myself I had a very marked attack at about the time when my tonsils were disappearing, and it is my custom that unless the projection causes disagreeable and uncomfortable symptoms to pay no attention to the condition. The lesions will disappear of their own accord if given time, and only the most radical procedures will help their disappearance.

In answering Dr. Goodale's remarks a discussion might be indulged in which would last indefinitely, but I would like to mention just one or two things in connection with the idea of this epithelial metamorphosis. The thymus gland, which is essentially an adenoid structure, has been shown of late years to be developed from the epithelial cells forming the original anlage. Beard has shown that no leucocytes can be found in the blood until they have occurred in the developing thymus. As the thymus disappears the tonsils develop, and later the solitary lymph follicles of the intestinal tract and the lymphatic tissue of the appendix very possibly carry on this manufacture of leucocytes.

HOW FAR ARE ABNORMALITIES OF THE NASAL SEPTUM RESPONSIBLE FOR MAL-FUNCTION OF THE NOSE?

BY HENRY L. SWAIN, M.D.

IT is well-nigh axiomatic, an aphorism, that if a person received the divine heritage of an anatomically and physiologically perfect nose and always lived a perfectly ordered life ever after, he, or more presumably she, would never suffer from catarrh, using the word as a generic term for nasal disease. With a perfect and perfectly functioning nose very little or no throat disease would exist, unless of tonsillar (lymphoid) origin or arising from systemic conditions. Assuming that germs existed coeval with man's origin, if not before, man is a mere incident to their career. They are parasites; man, the host or domicile. In ages past certain races of men may have been worn out for the use of some kinds of germs, so these last underwent certain changes which enabled them to still do business with the genus *Homo sapiens*. Of these acquired characteristics some remained and by the aid of these various races of germs have been perpetuated, so that we now have big and little, aerobic and anaerobic, capsulated and plain, crooked and straight, intercellular and free, cocci and bacilli. The cells of man have no sooner learned to repel one of the kinds than a new horde with different habits and desires swoops down upon them, and new protections must be erected, new defences established.

Inasmuch as it would be obviously a poor plan for either man or animal to always rely only upon the ability of the cells to cope with the germs and thus repel disease, gross methods of protection have always existed and are first used, and it is only on the failure of these that work is demanded of the cells themselves. Sneezing is perhaps the first method which is in use among animals to protect them against foreign matter which has entered the nostril, and from their sensitive mucous membranes the slightest irritant is immediately expedited, and sneeze follows

sneeze until removal is accomplished. When exercising or otherwise more liable to get floating matter into the nose, the dog, for example, breathes through the mouth, so that nothing may interfere with the important function of scent. In man and most animals the sneeze is followed by a flow of fluid, usually free from mucus, which in man represents not always a secretion from the glands in the nose, but rather a transudation through the cell interspaces in addition to the flow from the lacrymal glands. Man helps the cleansing or removal by the voluntary act of blowing the nose or snuffing back into the throat, followed by hawking. By these gross means gross or macroscopic irritations when present are removed. Smaller or microscopic particles which are floating in the air are first held up by the small hairs which grow more or less profusely at the entrance of the nose. These, especially when moist, must act as an effective sieve. Whether there is anything providential in the fact that the older one grows the more abundant these hairs appear to be is a matter for conjecture. Beyond the openings the mechanism of the perfect nose is admirable; divided by a septum in two equal parts, each with its subdivisions of the space into convoluted tubes or fossæ, bringing a large surface upon which to deposit the floating particles as well as a greater radiating equivalent in carrying out the physiological functions of warming and moistening the air. This subdivision in two equal sides and these again into tubes or gutters is essential also for good cleansing by blowing, as we often learn to our sorrow in atrophic and other diseased or deformed conditions. The general trend of the passages is downwards as well as backwards when the head is erect, hence exuded fluid, as from irritation, tends of itself to wash the foreign matter down and out of the nose—to the front largely by blowing, to the rear by gravity. All this is aided by the ciliated epithelium in certain parts, the ciliæ working in a general way backwards and downwards, helping very much, in my judgment, in preventing that prolonged sojourn of finely divided matter, whether active or not, which results deleteriously to the exposed parts. A further aid comes when by the swelling due to the erectile tissue the tubular passages become smaller, making the cleansing, when continuity is uninterrupted, from any given effort easy. The passage of a large quantity of air through a smaller tube gives greater frictional (cleansing) possibilities than when the same

amount of air with equal velocity traverses a larger space. So it transpires that the gross anatomical arrangement serves well to stop within the nose floating bodies, and the parts most liable to thus bear the burden and heat of the day are the anterior end of the middle turbinate and the inferior to a lesser degree. These project from the side of the nose where the currents of air must swirl past them with many an eddy as they stand boldly forth to stem the tide.

Now, allow that on the wings of a mighty inspiration floating matter has been wafted through the nose. The particles in the middle of the stream surge along until the current turns downward towards the larynx. Those with the greatest centrifugal inertia are thrown directly upon the posterior pharyngeal wall. Covering this whole posterior surface, where there is little or no ciliated epithelium, there is a protective layer of mucous secretion which immediately enmeshes anything which lands upon it. Gravity and fresh secretion soon expedite such detained matter downwards and out. So all kinds of dust must run the gauntlet ere they get into the larynx and trachea, and, although much gets through safely without let or hindrance, still the protective apparatus does lessen the danger by the peculiar construction of the parts.

But how about microscopic particles, the subtle germ whose entrance is not heralded by any such cataclysm as the violent sneeze? The entrance may take place in the dead of night, and only the ever watchful epithelial or endothelial cell by chemotactic sense or electric thrill learns that the invader is at hand.

When the sentinel gives the alarm immediately the leucocyte, with phagocytic appetite, sallies through the portals, and with his exit from vessel and tissue more of his kind are hurried to the front, more blood comes to the vessels, they passively stretch, capillary congestion and venous stasis allow the passage of the white cells and serum into the tissue, the whole membrane swells, mucous glands pour forth abundant mucus, contacts are established between adjacent areas, sneezing again results, either from mere contact or from fluids running down between surfaces not absolutely touching, and the fight is on.

This considers merely the nasal mucosa, not the tonsils. Here the process is so different that another figure must be used. That we do not oftener have nasal invasions comes from the mechani-

cal action of the normal ciliated epithelium. The removal is aided by the fact that the serous fluids constantly present on the surfaces have a deterrent effect on germ growth if not actual germicidal action. Life is not easy for the germ, and unless it is midway in the stream of air and strikes no hindrance on its way to the trachea the convoluted surface of the nose catches it, usually to its death.

Whether as in adults, upon the broad arched roof, or as in children, on the shallower and more sloping vault, if the germ is caught upon the posterior pharyngeal wall it meets lymphoid tissue, and here lies the most active of the repellent forces of the upper air passages. Immediately beneath the epithelial layer, which is of the flatter, squamous type, and even between the cells themselves, lie thousands of potential leucocytes capable of amebic motion, and although the lymphoid tissue really is but a modified lymph node, still within its outer walls of epithelium lie a vast army of rapacious phagocytes which rise in wrath and indignation to combat with the invading hosts. So here again the unlucky germs when, by their very speed, they are carried past the outworks of the nose find defenders present and usually perish.

Thus it is reasoned that the anatomical arrangement of the nose is such that, by the free flowing of mucus, the motion of the ciliated cells, and the general trend downwards and backwards of the passage allowing the protecting fluids more easily to accomplish their cleansing, it actually tends to remove all inorganic and insoluble matter and to thwart the prolonged resting of the living and active substances. The chemical or phagocytic destruction of living organisms falls upon the cells by the failure of removal by these previously mentioned means.

Several ways exist naturally to render the protective system useless. First the grosser methods are rendered impossible by deformities of the skeleton of the nose rendering ready cleansing by sneezing and blowing and the free downward flow of fluids practically impossible. Here is a chance of which the invaders readily avail themselves. Skulking back of a large exostosis, they evoke secretions which remain in situ, producing a splendid breeding ground for the germs, warm, snug, and nutritious, and hundreds, yes thousands, are bred where one attacked at the beginning, and their very numbers overcome the cell defenders in that little area, resulting in an acute rhinitis. Mayhap an artificial cleanser might

have removed the intruders, but natural methods failed because of unnatural conditions. The cells were all healthy perhaps, but the odds against them in a limited area were too great.

The protective organization depends again on the integrity of the outer wall, the epithelial layer. Suppose through injury some considerable area of ciliated epithelium is dead, or through great debility or perhaps through prolonged exposure to great cold, chemical irritation, or dry heat, the actual activity of all the ciliated epithelium in the nose should be reduced to the minimum, or even inhibited for a time. Then how easily could the hardy germ work in past the outer wall "while yet they slept who should protect." Under such conditions, or those of profound systemic depression, the activity of not only the ciliated epithelium but also the appetites of the usually voracious phagocytes might be reduced so that again the germ might get in beyond the outworks. Such or other conditions of the system might produce a different serum, might modify the amount of fluid actually running into the nose, or might add more or altered mucus in which germs would actually thrive. These are but a few of the suggestions which rush to one's mind whereby the outworks and defences of the nasal tract may, so to speak, be rushed and stormed, and thus the disease become systemic because the germ has lived to perpetuate its kind owing to lack of or imperfect cell-guard.

We have considered macroscopic and microscopic forms of invasion and the means of protection against them. What shall we say at this juncture of the yet subtler irritations, chemical, electric, we know not what, which are only apparent to the hyperesthetic cells of the susceptible, when they react to the immeasurably small particles proceeding from hay or flowers, from the horse or from the cat, or from a special brand of feathers, or even the odor of perfume, as musk? How intangible is such an emanation; as easy to grasp as an atom, as easy to see as an ion, as easy to understand as the mysteries of Providence, unless, forsooth, you are cursed with the responsive cells, and then all is so different. How excruciating the irritation, how obvious the tears, how abject the victim, until he feels sure that he represents the torments of the evil one. These, by all other means imperceptible forces, make themselves as evident to the victim as to another would be a dose of red pepper in the nostrils, and it seems to me the conditions are absolutely parallel. What an explosion of all the repellent forces

we have considered takes place in both instances—sneezing, blowing, floods of serum, and tears, even of mucus; what redness is evoked, what stoppage in the nostrils, all to rid the membrane of the irritant. The protective system is again trying to do its allotted work, and yet how infinitesimal the particle, how attenuated the influence, how it must be reduced to the utmost refinement of chemotaxis in order correctly to estimate what it means. If the unsusceptible are, on the one hand, so irresponsive, and the susceptible so abjectly enthralled, must there not be great differences in the characteristics of the cells themselves? And if of these in the nose, may there not be also similar differences in many other cells of the body? Is it not analogous—but equally mysterious—to the differences which must exist in the cells of the gray matter of a Huxley or a Kelvin as compared with those of an imbecile or an idiot? Nor does this problem present one whit greater difficulties than to understand how the nerve endings in the dog's nose discover to him his master's footsteps among those of a multitude, or lead the unerring bloodhound straight to his victim. Ponder as we may on these wondrous powers, another problem confronts us of equal difficulty. Solve it, and you have the key to all physiologic phenomena—yes, the keys of life and death are in your hand. How do the ever watchful epithelial or phagocytic white cells know that disease germs are present—distinguishing as they apparently do between inert matter which they allow to pass, harmless living matter which they allow to remain, and pathogenic germs which they endeavor to destroy? By what alchemy is the whole system aroused as the grippe germ begins work in our bodies? By what fell charm does the meningococcus reduce the guard at the front, pass in, and, having massed his army within the gates, in a moment, the twinkling of an eye, the victim lapses into unconsciousness, perhaps never to awake? And yet our daily walk and perpetuity depend upon the vigilance, discretion, and discrimination of a few cells. How little, then, must it take to disturb the happy equilibrium of decay and restitution which we call health; how little to knock out our protective system. And yet this is only the beginning of the problem.

From repeated acute attacks of rhinitis come chronic catarrhs. The existence of chronic catarrhs makes us susceptible to renewed acute attacks, and so the endless chain of cause and effect and effect becoming cause brings about chronic inflammation within

the nose. The mere hyerplasia of repeated attacks of acute rhinitis is succeeded by hypertrophy, hypertrophy leads on the one hand to atrophy and on the other to edematous conditions and polyps, and both lead in the end to bone changes. Then we have the gross effects seen in the operating room of the surgeon and in the dead-house.

In all these cases something defeated the plan of nature and the nose has ceased to be a perfect and perfectly functioning organ; in fact, it has become, instead of a safeguard, a menace to the health. Instead of cleansing and freeing itself of germs, it harbors them. Instead of secreting a fluid detrimental to germs, it serves up a most nutritious pabulum for their use. Instead of breathing pure air in open protest to sedition, it closes a nostril, and, granting to certain applicants the seclusion of private apartments, an antrum or a frontal sinus, cultivates as pure and virulent a culture of a select breed of coccus as ever graced a laboratory incubator. Surely something has happened to disturb the order of nature, and it has been the habit of the rhinologist, either by open assertion or tacitly because of his unvarying practice, to lay the burden of all of this pathological change and disturbance of function when of a chronic nature to the septum, the erring brother upon whose shoulders as upon a scapegoat is ignominiously loaded all the blame for all that has happened. And never has a defender arisen for the poor helpless victim. Condemned without a hearing, and if but to a decent death, how differently might we review the past! The utmost refinement of savage butchery pales into sordid insignificance when the detailed sufferings of the nasal septum are spread before us.

Notwithstanding, however, the most unprecedented activity on the part of the profession, during the last twenty-five years, there have lived and died at a ripe old age in every community a few unmutilated persons. These have passed to the great beyond from reasons incident to senility or from accident or from disease of other parts of the body, having never suffered from impairment of hearing other than presbyakousis or any other so-called catarrhal difficulty which caused them to become the legitimate prey of the specialist, and yet they have harbored from their earliest infancy more or less crooked septa which they inherited as a result of facial asymmetry, these irregularities exaggerated by the accidents of disease, neglect of teeth, and trauma in youth, so that

they have finally possessed through years as grossly misshapen septa as it has ever been our fortune to hack and hew into the semblance of orthodox uprightness. And when we think, on the other hand, how rarely there ever is a straight septum, should we not be made to wonder, if our premises are correct, why anyone ever escapes with two good ears and a healthy pharynx?

And while we are on the point, have we not all got the septum habit, the habit of doing something to the septum so much as a routine that we feel that we have almost been derelict in our duty by the patient who applies for treatment of his nasal catarrh if we have not vigorously attacked the dividing wall of his nose? What has been the method of reasoning? Are we correctly understood when we are accredited with believing that the deviations of the septum from the straight and perpendicular are of such immense importance? We as members of this Association and in our work as clinicians and teachers in medical colleges have certainly given the impression that the origin of the pathologic conditions known as chronic catarrh is to be traced in man to the disturbance of the function of the nose which results when the septum bends to either one side or the other, causing narrowing and pressure and lack of proper aeration. It has been usually reasoned that an exostosis, for example, which projects from the septum far over toward the lateral wall must interfere with the function of the nose in three or four ways. First, the air could not with proper freedom pass through the nose; the whole stream of air must be turned one way or the other or divided by it. Second, it interferes with cleansing the nose by blowing. Third, it presses upon the mucous membrane of the turbinates when these swell, as in the ordinary physiologic ebb and flow of the blood in the nostrils or when irritated or inflamed. This constant condition of greater or less pressure interferes with the proper circulation in the membrane. It interferes with the cleansing. It interferes with the work of the protective system. It affords a chance for the retention of discharge. This discharge when retained may become fetid and irritating, may destroy ciliated epithelium by drying or by the virulence of the germs which are in culture in the fluid secretion, so that, being in the way, producing nothing but ill effects, the dictum goes forth: as it can bear nothing but ill fruit, "Cut it down, why cumbereth it the septum?" Certainly with this view our attitude seems, in the light of the present-day conception,

perfectly rational, perfectly proper. In a marked instance of this description as in a marked instance where the septum is bent so as to actually interfere with breathing, there can be no argument against ridding the host of such abnormalities and the difficulties which result therefrom. It remains, therefore, if these premises are accepted as correct, to accomplish this by as mild measures, with as little destruction of normal epithelium, and with as good preservation of the normal anatomical construction of the parts as possible.

I certainly cannot make it seem right to remove turbinate tissue when it is an exostosis of the septum which is at fault. It may be easier, but it is not logical. Neither can I make it seem right to remove turbinal tissue when what is needed is to make a crooked septum straighter. Especially to-day, when submucous resection in conservative hands seems so successful, there is no good reason for halting in one's duty.

And yet, when we come to look back after twenty or twenty-five years of work, to follow up the cases wherein we have done all these things by what at the time seemed to be the best method, has the catarrh that we seemed at first to relieve always remained permanently benefited? When we have done our best sometimes to straighten a septum and remove a spur, have we not merely improved conditions and not completely relieved them, and are we not compelled many times after our utmost endeavors to cure great deformities to leave the patient's septum in a condition in which he is no better off than another unoperated patient who comes with a most atrocious catarrh? Here we find but a slight bend perhaps. Do we not fall into the habit of laying the whole catarrh to this slight bend, which is no worse than the best result we could obtain in the other case, and have we not operated many times on these lesser curves, following out the idea almost from force of habit? And then do we not, if we see these patients years afterwards, find that they again have the hypertrophies, again have the frequent colds, again have the catarrhal dropping? Perhaps the polyps have returned and mayhap the sinusitis. We have in each of these instances gone to the full extent of what was needed in reforming the septum, and yet in spite of these radical measures again the catarrh recurs.

This must mean, then, that it requires something more than the bent septum to produce catarrh, and the question naturally arises:

Is it not in the life that we of the present day are compelled to lead? The dust, the confined, narrow apartments, the dry heat, the late hours, the busy work, all contribute to a condition of nose and body which causes a catarrh to return which, while the patient was directly under our care, certainly improved. These latter thoughts have been forced upon me in the last few years as, looking back over a considerable period of active work, I have been forced to believe that the septum alone is not responsible for all that we have placed upon it.

Since beginning the series of papers which I have presented to the Association in the last few years when the relation of the arch of the palate to the septum was studied, I have made it the invariable rule with every patient who came in to examine the septum and to find out the amount of catarrhal difficulty existing, questioning the patients who came to me about other matters not conscious of any catarrh, inquiring as to the amount of catarrh present at the time the patient came as compared with the years and years during which he must have had a crooked septum. I find that it is certainly possible for crooked septa to exist in healthy individuals who lead well-ordered lives without ever producing noticeable catarrh. Secondly, that we can bring the septum into subjection, straighten it, plane it down, smooth it off, and still colds and frequently repeated annual catarrhs continue, while sinusitis is brought about in spite of it all. Unless the life of the patient is changed in some way or his constitutional conditions modified, hypertrophy will again return, and it seems to me that we have fallen far short of our duty by our patient if we simply correct the errors of the septum and cauterize the turbinates. Ought we not then, as we present various ideas to the public, to right the impression which has gone abroad, thanks to our own faulty presentation it may be, that a rhinologist when he is not opening a sinus is merely the carpenter of the septum?

Certainly, having in mind the protective apparatus alone, we should bestir ourselves, take into our confidence if necessary the family physician, investigate into the life the patient is leading, into the finer details of every-day occurrences, to search out a method that shall have the wider, broader possibilities of therapy in mind rather than to confine ourselves so strictly within the narrow quarters of the nose and limit our endeavors to such stunted conceptions.

Discussion.

DR. W. E. CASSELBERRY.—I hardly think that this Association, either by word of mouth or in line of action, has conveyed the impression that the septum is such an all-important feature in the etiology of inflamed conditions in the nose. The salient idea urged by the essayist, that the septum is not the whole etiologic condition, has always been recognized by this Association, and many have been the protests which have gone out from members with reference to the excessive surgical work which has been and perhaps is now being done upon the septum. Being thus in accord with his idea, believing that the Association individually and collectively has stood in times past and does stand now for the very position which is taken by the essayist, the question reduces itself to one of good judgment to determine what degree of evil is due to the deformed septum; hence what degree of relief or cure reasonably can be expected from correction of the deformed septum. If it were not that we do give such cases individual care based on the judgment that comes from study and experience, furthered by a consideration of pathology in general, we might just as well, as the essayest says, be carpenters for the septum, which we are not. If the septum were the whole cause of nasal disease we need not be more than carpenters, but it is not. A deformed septum is merely one factor in etiology, but often an important one, and then a skilled correction of the deformity is a most beneficent operation.

DR. C. W. RICHARDSON.—It strikes me that Dr. Swain's paper has come at a timely moment, especially so at this time when we find a new operative method has been introduced into our surgical technique for the correction of changes in the conformation of the septum. This technique, the submucous operation, will lead no doubt to a greater increase in the amount of surgical work upon the septum narium. There is no doubt that the septum has been in the past—and will be in the future—subject to a great many surgical attacks which are entirely unmerited. As Dr. Casselberry says, almost all the members of this organization are in accord as to the innocuousness of the septum with regard to the pathological changes in the nasal cavity. Of course, we are all in accord with this fact in regard to normally placed septa which do not interfere with the air current, which has not been well brought out in the paper; but the fact is that there are changes in the septum which in themselves do produce more or less disturbance of the functional activity of the nasal organs, especially when the septum is so displaced as to more or less, or to a greater or less degree, interfere with free nasal respiration, or by its contact with the turbinal tissue interfere with the function of those bodies, thereby creating pathological changes in the nasal mucosa, which has not been

clearly brought forward in the paper; but there must be a sound of alarm go out against the tendency to operate upon septums simply because they are misplaced, simply because they present a change from the normal outline, or present a new growth on the surface, and reasoning that these new growths or these changes from the normal must be the cause of the impaired condition or the condition which requires relief. There is no doubt that a great many of these cases are unnecessarily trifled with, and will be much more so in the future. I think that the paper is very timely in raising a cry against this condition of affairs.

DR. SWAIN.—I feel that it is almost necessary in introducing such a paper before this audience to offer an apology. I certainly did not have it in mind to hit at any member of this Association any more than myself. Disguise matters as we will, it is easier for us to consider that it is necessary for us to take off a spur projecting from the septum of a wealthy patient than in the case of an impecunious relative. It is a good deal easier to discover difficulties in the former case than in the latter, and the question is, on how sound a pathological basis do we rest most of our conceptions? It is exactly with that idea in mind that I got into the line of thought which I presented to you to-day. I am admirably situated for observing the work of others, living in New Haven. The students come to Yale, some having had the work in the nose and throat done by the best men in the country,—done by you, gentlemen. Others come who present the worst work I ever saw. We find that a great many of them have had nothing in the world ever done for their noses, except to have endured surgical attention, perhaps in one operation, on their septum. They have not been even asked to grace the consultation chamber again with their presence after that first interview, therefore never stopped to think about subsequent care, or that any further treatment was necessary. Now, furthermore, we are all teachers here. We teach by what is most graphic. The student of to-day is brought up by the kindergarten method. He takes in only what he sees, and particularly what he sees us do as he comes to our clinics. As I put it in the paper, these operations are objective. The student sees them and grasps them. These major strokes are those which the chief of clinic is liable to do himself. The lesser operations, left to the assistants in the clinic, make less impression on the student, and so he goes out from the atmosphere, which may be of the best, with two thoughts in his mind: he has in every given patient either to find a sinus or operate on the septum. I see those things especially emphasized, living as near as I do to New York. No fault of any particular clinic or of conception on the part of any one of us, except that perhaps we have not had enough to say about other pathological possibilities than the septum. The students take a six weeks' course in our special line of work and

then go out into the world feeling themselves licensed to seize and cut anything that comes to their hand as the only means they have of combating disease in the nose; and it is such faulty conceptions which I hope we as teachers in the future will be able to set right.

PERFORATION OF THE SEPTUM NARIUM.

BY CHARLES W. RICHARDSON, M.D.

IN this paper it is my intention only to consider that type of perforation of the septum that has no known etiological factor and an indefinite pathological history. In a paper upon this subject which I read before the Laryngological Section of the New York Academy of Medicine in November, 1901, I divided perforation of the septum into two distinct groups, viz.: 1. Those having a known etiological factor and a definite pathological history; 2. Those without a known etiological factor and an indefinite pathological history. Under the first group may be classed congenital perforations, traumatic perforations, those perforations due to pressure exerted by new growths, and that large group of perforations occurring in the course of general or infectious disease, as the syphilitic, the tubercular, the lupic, etc. The pathological process by which destruction of more or less of the septum is produced in the first group is characteristic of the pathological changes produced by the general condition as it affects similar tissue wherever located. Under the second group we have no definite assignable cause for the perforation, and almost as little do we know of the pathological steps from the disturbance of the integrity of the mucosa to the actual production of the perforation through the cartilage. This class of cases is the one to which, in particular, I direct your attention. During the past ten years I have been carefully investigating the history of all cases of septal perforations coming under my observation, and the more I investigate this subject the more do I become impressed with the fact that the many accepted views with regard to the causation of these perforations are not always tenable. In none of my cases can the condition be assigned to the irritation or caustic action of acids or chemicals. In only a few was there ever any history of obstruction; therefore no possible irritation from mechanical causes, or continued and persistent local trauma. The great obstacle to the thorough understanding of this subject is, as in atrophic

rhinitis, that no investigator has been able to follow up a sufficient number of cases from their inception to the actual termination of the disease process. All who have done much surgical work upon the septum have noted, when injury is done to the septum at its anterior inferior portion, how imperfect is nature's effort at repair. If the injury be great and the solution of continuity through both mucous surfaces at the above designated point is complete, the tendency to molecular disintegration with perforation is greater than is the tendency to repair with restoration. In the several cases that we have noted of commencing perforation of the septum of the second group, we have been impressed with the fact that this process of ulceration continues to extend until the normal nutritive changes are sufficiently strong to resist the onward encroaching ulceration. This region is particularly subject to disturbance of its local innervation on account of its being constantly subject to irritation and injury, and from the fact that it is the first portion of the nasal mucous membrane to receive the impact of the incoming column of air. The mere influence of local irritation and the varying condition of the incoming column of air within themselves could have no determining influence on the integrity of this tissue other than probable changes in the epithelial and glandular structures. There must be some determining constitutional condition, which, in a certain series of cases, lessens the normal nutritive activity of the affected tissue, so that ordinary sources of local irritation continually present may lead onward to further destructive changes. It cannot but be accepted that certain constitutional disturbances impress or influence the innervation of certain tissues or organs so that they become subject to pathological changes, which most frequently show the usual pathological characteristics of the affecting lesion, yet at other times not bearing these evidences.

After a thorough investigation of the many cases of septal perforation which have come under my observation, I have been forced to the conclusion that there must be some constitutional disposing cause giving rise to many of these. We cannot throw lightly aside the evidence given by numerous observers as to the many changes which lead up to the development of the ulcer, that is, the local vascular changes such as hemorrhage into the mucosa, xanthosis, thrombosis, and coagulation necrosis, all of which indi-

cate a local impaired nutritive change in the mucosa, because such changes are frequently observed in those cases which do not produce ulceration or terminate in perforation. Independent of the local change present, there must be, as I have already stated, some constitutional determining causes which, in a certain series of cases, lessen the normal nutritive activity of the affected tissue so that the molecular disintegration or ulceration takes place, such ulceration extending until the normal nutritive changes are sufficiently strong to resist the onward enchoarching ulceration. It seems quite consistent to suppose that during the severity of the typhoid, or typhus, such a lowering of the nutritive activities may take place in the septum, as well as any other tissues, so that local changes already present might lead on to further destructive changes. There is no doubt, also, that there is something imparted to the tissues, especially of the fibrous and epithelial type in the tubercular or tubercularly inclined, which renders them, when the nutritive changes are low, liable to changes of a retrogressive or destructive nature. In my original report I gave seventeen cases of septal perforations which had no assignable cause, in a large percentage of the bearers of which there was to be traced a distinctively tubercular history. The proportion of 68 per cent. of these had histories with tuberculosis or manifest evidences of tuberculosis in the person affected. I have collated fifteen cases since my report of perforations occurring in cases which belong to the second group.

CASE I.—Young woman 18 years of age; perforation involving a large portion of the quadrangular cartilage; hemorrhage existed since early childhood. No deflection. Traced to a typhoid.

CASE II.—Young woman 30 years of age; large perforation cicatrized. Perforation had existed for many years; does not know when she was not conscious of it. Strong tubercular family history. Patient infected.

CASE III.—Gentleman 68 years of age; large perforation, healed edges cicatrized; dates from early childhood. Both parents and brother died of tuberculosis.

CASE IV.—Man 48 years of age; moderate-size perforation; strong family history of tuberculosis. Patient went to the West when a young man "for the purpose of saving his life."

CASE V.—Young woman 21 years of age; small oval perforation; healed margin. This perforation was accidentally discovered while making the usual routine examination for tuberculosis.

Patient after spending a year in the Adirondacks returned to Washington perfectly restored in health.

CASE VI.—Woman 40 years of age; large perforation. Never able to obtain satisfactory history. Patient cocaine and morphine fiend.

CASE VII.—Young man 40 years of age with a large perforation. Was called to see this patient on account of the condition of his ears. Never was able to get satisfactory family history; denied all tuberculosis. Patient was operated on for various conditions of the kidney and bladder; died of chronic septicemia.

CASE VIII.—Gentleman 70 years of age; large perforation and supposed to have had tuberculosis when a young man; mother and brother died of tuberculosis.

CASE IX.—Woman 65 years of age; large perforation, clean cut borders, healed. Perforation has always existed. Died of tuberculosis shortly after coming under my observation.

CASE X.—Young woman 30 years of age; moderate-size perforation. This perforation has taken place since I saw her some ten years ago. Has tuberculosis; spent year or more in the Adirondacks.

CASE XI.—Young married woman 32 years of age; large perforation; father tubercular.

CASE XII.—Young maiden woman 42 years of age. It is interesting to note that I saw this young woman about four years ago, when a commencing ulceration was showing itself in the mucous membrane. I made all efforts to get rid of this condition, and thought I had healed the ulceration and she went from under my observation. About six months ago she returned to me and I found a large perforation through the septum. Mother and sister died with tuberculosis.

CASE XIII.—Young woman 26 years of age; moderate-size perforation. No distinct tuberculosis in the family. Patient looks strumous; does not know when perforation occurred.

CASE XIV.—Young woman 22 years of age; large perforation. Patient consulted me on account of tuberculosis.

CASE XV.—Young woman 22 years of age; small-size healed perforation; said to have occurred during an attack of typhoid when she was 12 years of age.

In an analysis of the fifteen cases above narrated, it will be noted that in eleven there was either the direct physical evidence of tuberculosis in the affected individual, or that the perforation took place in the individual which we might say had well marked family history of tuberculosis. These fifteen cases, added to the seventeen reported in my previous paper, make thirty-two cases, with a total of twenty-two cases in which tuberculosis was more or

less in evidence, with ten without such evidence. The occurrence of 66 per cent. of perforation in the tuberculous or tubercular predisposed individual must be more than a mere pathological coincidence. Also the findings made by Weichselbaum and Hajek upon the cadaver more than prove the deduction which I have drawn from observation upon the living.

To me it seems as though the process is one that is predisposed by impaired nutritive action in the mucous membrane covering the cartilaginous septum as well as in the cartilage itself, such nutritive change being induced by diseases which impair the general nutritive activity by their ataxic type, as typhus, typhoid, and kindred diseases, or by tuberculosis and the tubercular diathesis. Tuberculosis and the tubercular diathesis, as is well known, impress upon various tissues and organs of the body such alteration in their nutritive processes that when the proper stimulus is applied they lead to degenerative changes which may or may not show the characteristic histologic elements of tuberculosis.

We all frequently observe during our routine work the various changes which have been described by Voltolini, Zukerkandl, Weigert, and Hajek as affecting the mucous membrane of the septum, many of which endure for years without change, many heal, and a few ulcerate with destructive perforation of the septum. That the greater percentage of cases show no lethal activity in the mucous membrane or cartilage of the septum is, I think, due to the fact that the nutritive activity in the cartilage and mucosa is normal; when this is abnormally lowered, due largely to the predisposing conditions above mentioned, we have the lethal changes resulting.

Discussion.

DR. EMIL MAYER.—I would like to ask Dr. Richardson whether in these cases that showed evidence of general tuberculosis—all but one having epistaxis—whether the others had frequent epistaxis also. I have seen a number of cases of perforation resulting with a beginning history of epistaxis, a very small ulcerative process at first on the site where the ulcer subsequently appeared, and where there was subsequent destruction. The history of epistaxis was there and might perhaps very easily explain a direct process.

DR. C. F. THEISEN.—There is another class of cases which sometimes lead to perforations of the nasal septum and which sometimes occur in perfectly healthy patients, without any history

or evidence of tuberculosis. I refer to the circumscribed abscess of the septum which is situated very often on the quadrangular cartilage anteriorly. Just what the cause of such an abscess is I do not think has been positively determined. I myself have seen several cases coming on idiopathically in perfectly healthy individuals. Only four or five weeks ago I had occasion to observe such a case in a perfectly healthy man.

DR. RICHARDSON.—Traumatic?

DR. THEISEN.—It was not traumatic. His nose was enormously enlarged, and he consulted a skin specialist, who first pronounced it erysipelas. He had a large circumscribed abscess which apparently originated at this part of the quadrangular cartilage. There was a discharge from both nostrils. I opened the abscess and got out a large amount of pus, and did not cut through the septum. Several days afterward there was a discharge from the other side, and with a probe I could go through the quadrangular cartilage. I would like to ask Dr. Richardson whether he includes cases of that sort in his paper.

DR. J. O. ROE.—In all those cases of perforation of the septum in which the etiology and pathological history are so clouded in obscurity, I regard syphilis as the most frequent underlying cause; not only in its active form, either secondary or tertiary, with its frequent nasal manifestation, but in that form which we may term a syphilitic dyscrasia, such as we see manifested in various latent forms in other portions of the body. Next in frequency tuberculosis acts as a predisposing cause. Of the thirty-two cases reported by Dr. Richardson, he tells us that in twenty-two of these patients tuberculosis was more or less evident. While these cases may present an indefinite pathological history, I do not see how we could regard them without a known, or a very strongly suspected, etiological factor when associated with tuberculosis. The local disturbance of the nutrition of the different parts of the body is so frequent and so well known in tuberculosis that we could not expect the nasal septum to be exempt from this influence, particularly when so much exposed to local irritation. The same local disturbance to nutrition also results from the constitutional disturbance of typhoid or typhus fever, the exanthemata, etc., and to which the perforation can be ascribed when this relation of the two can be established.

A gentleman about 40 consulted me a few days ago with reference to an ethmoid trouble which he had had for a considerable time. On examination I also found an old perforation through the cartilaginous portion of the septum. Several years before, he said, he had had typhoid fever attended with profuse epistaxis, for the arrest of which firm packing of the nose was necessary and to which the perforation was ascribed.

Now in this case we are not sure which caused the perfora-

tion—the disintegration of the tissues by the disease that caused the hemorrhage or the pressure from the packing. Probably the two combined.

There is one cause of perforations of the septum which can be classed under the second type of Dr. Richardson's classification. It is the erosions of the septum caused by the removal, by the fingers, of scabs that form on it of dried discharge from the upper portion of the nasal passage. By this continued removal of these scabs the septum is slowly eroded or bored through, so to speak. I have seen a number of cases in which this was the undoubted cause.

DR. A. B. THRASHER.—I have been very considerably interested in Dr. Richardson's paper, and he may recall possibly that some eighteen or twenty years ago I had a paper before the Laryngological Section of the American Medical Association at Newport on the same subject, and my conclusions in reference to these septal perforations were very different indeed from Dr. Roe's. In fact, I could trace syphilis as the cause only in those cases in which the bony tissue had been affected; in those in which the cartilaginous tissue alone had been perforated syphilis could not be directly given as the cause in any of those cases. I remember I was myself considerably surprised with my deductions, because I had been taught just as Dr. Roe had said, that in the very large majority of cases of perforation of the septum syphilis was the prime factor.

In reference to tuberculosis, however, I have not been able to find so many cases as Dr. Richardson has found. I am only certain of having a tubercular ulcer in one case out of the large number that have fallen under my observation. However, I do not mean to say that I have not seen perforations in tubercular subjects, but a distinct tubercular ulceration or perforation of the septum I have only seen once.

I rather think that if you go far enough back, Dr. Mayer has made a suggestion that might possibly change the diagnosis of some of these into traumatic perforations. A very minute perforation might have been caused by a trauma—a foreign body picked by the nail (this tissue is not supplied profusely with nerves), and consequently an irritation can be easily started. I have no doubt in the case of a tubercular history, or where there is tuberculosis present in other organs, the mucous membrane covering the septum might be more easily destroyed. Consequently a continual picking of the nose would be more apt to be followed by repair in case of good healthy tissue than in these. So I have no doubt that while tuberculosis may be a factor in these cases, it is not its exciting cause. It is only an incidental cause lowering the vitality of the tissue in this region, and thus preventing repair to the tissues which have been injured. In so

many of these cases do I find the beginning of the apparent cause a small hemorrhage from the nose, and this resulting in a little blood clot or little crust formation; the patient picking this off time and time again has apparently made the perforation. In many of the cases the perforation has come on without the patient knowing it, because the organ is not profusely supplied with nerves.

When, however, syphilis has been the cause of the perforation, I believe a gummatous growth has formed, usually within the periosteum of the tissue, and you will find almost invariably not only the cartilaginous wall but also the bony wall to be involved. And since a perforation of the osseous septum is found so much more seldom than of the quadrangular cartilage, I would put syphilis as rather a rare cause of perforation of the nose in comparison. And may these little perforations which occur in the anterior cortex not be due to trauma, a very slight truma?

DR. W. E. CASSELBERRY.—The last speaker's remarks recall to me a point in diagnosis which has been an aid, and which I have seen but infrequently mentioned. As stated, bone involvement indicates syphilitic etiology. In addition, however, those cases of perforation which are limited to the cartilaginous septum, in which the edges bounding the aperture are thicker than normal cartilage, I have attributed to syphilis. I cannot say that this is invariable, but it is usual. The preceding stage of a syphilitic perforation of the cartilage is a gummatous infiltration, and as ulceration ensues by softening first from the central part of the guma its outlying boundary is apt to retain an infiltrated thickness; on the other hand, in non-syphilitic perforation it is found that the bounding cartilaginous edge is quite thin, thinner even than normal cartilage.

DR. J. L. GOODALE.—With regard tc the type of syphilis and the alterations found in the septum, we may find a gumma of the perichondrium or a superficial gumma of the mucous membrane, the latter resembling the superficial gummata of the skin. This may give rise to a perforation wholly within the limits of the septal cartilage, which is characterized, as Dr. Casselberry has said, by a thickening of its margin. These conditions have seemed to me of slower course than those beginning in the bone. In a case recently seen, a man complained of progressively increasing nasal obstruction for several months, and showed a gumma situated in the mucous membrane of the septal cartilage, leading to perforation. At no time, however, was it possible to detect bare bone with the probe. There was prompt response to mercury and iodide of potassium. The perforation seems actually now smaller than when it first occurred.

DR. J. O. ROE.—Since listening to this discussion I would like to say a little more regarding syphilis as a predisposing cause of perforation of the septum. We all know the proclivity of

syphilis for the nose and that in no part of the body is it so active nor manifests itself so frequently as in the nasal septum. In the acquired form syphilis is more prone to attack the bony structures, while in the hereditary form it has a greater affinity for the cartilaginous portion of the septum.

Many years ago Dr. S. D. Gross very ably declared that he regarded hereditary syphilis as the underlying cause of all forms of scrofula or, so called, scrofulous diathesis. I believe in many respects the doctor was right and that the deteriorated condition of the system in those cases, regarded as an hereditary scrofulous diathesis, is due to a transmitted sphilitic taint having its origin in the misdeeds of the forefathers. Moses recognized this when he said the iniquities of the fathers shall be visited upon the children unto the third and fourth generation. We all see many cases of perfectly innocent persons presenting unquestionable manifestations of syphilis, in which the treatment fully confirms the diagnosis. Therefore, when all other possible causes for the perforation of the septum can be excluded we will make fewer mistakes by following up and confirming this opinion by the proper treatment than by waiting for further evidence or insisting on eliciting a history of an infection.

DR. RICHARDSON.—Probably I can reply to several questions by one answer. I tried to make it plain in the paper that I was discussing simply one type of perforation, that type of perforation which has no assignable cause and no definite pathological history. In that way I eliminated all traumatic, syphillitic and distinctly tubercular and various other forms of perforation. In reply to Dr. Theisen's remarks, I should judge that his case was evidently one of distinct trauma, that is, was produced by some injury which caused a hematoma or abscess of the septum, and the latter probably caused the perforation. We see these occasionally. Dr. Trasher's original paper I remember very well having read. All that I wish to demonstrate by this exposition is that I have found so many of these cases in connection with the tubercular or tubercularly inclined people, I do not claim or insist upon it or advance the theory that it is the exciting cause of the perforation. I simply bring it forward as a possible predisposing cause for these perforations. I have been asked also if these cases were pathologically and bacteriologically studied. I will say no. It is very difficult to examine a good many of these cases pathologically, because, in the first place, in many instances we have healed ulcers, and secondly, because, when we find uncicatrized borders, one feels very dubious about starting up the process again and possibly increasing the size of the perforation by taking away the mucous membrane or cartilage. In several marked tubercular cases I made bacteriological examinations, but nothing was obtained. In reply to Dr. Mayer with regard to hemorrhage: I simply mentioned the hemorrhage in that one case in

order to show the probable period in which the perforation had started, hemorrhage usually being present during the process of ulceration and breaking down of the mucosa and cartilage. Any ulcer not healed is liable to bleed at any time.

THE ULTIMATE RESULTS OF RADICAL OPERATIONS UPON THE ACCESSORY NASAL SINUSES.

BY D. BRYSON DELAVAN, M.D.

TEN years ago, at a meeting of the British Laryngological Association, the writer advanced the question, "What is the ultimate result of operations for the relief of suppurative disease of the accessory sinuses?"

At that time operative work upon these cavities was of relatively recent origin. The names of such men as Bryan, Luc, Max Schaeffer, etc., were already well known. Much, too, had been accomplished in the study of the pathology of the subject, by Zuckerkandl and others, as well as in the improvement of the details of the surgical part of the work. Already, also, the treatment of many difficult cases had been undertaken, in many instances with brilliant results. All of this, however, had occurred within the space of a few years, a period of time too short to permit of definite conclusions as.to the final condition of patients thus operated upon.

Meanwhile, in the last decade, the number of sinus cases presenting themselves for operation has been greatly augmented by the prevalence of grippe and by the wide diffusion of diagnostic knowledge.

Operations upon the sinuses are commonly performed in important clinics, and there are probably few cities of any note where cases of the less obscure kind could not be treated with a fair measure of success. These things being so, it follows that in the last fifteen years a large number of cases have been operated upon, some of them at least at a time so remote from the present that there can be no question as to what has been their final outcome. Many of these cases have been brilliantly successful, both from the point of view of the surgeon and from the experience and testimony of the patients themselves.

In some, on the other hand, relief has not been finally afforded, or else the progress of the case has been painfully slow

and the ultimate outcome unsatisfactory and disappointing. Unfortunately, here as in other departments of surgery, the unsuccessful cases are not often reported and statistics calculated to show the relative value of different methods of operation are not attainable because the material for them has never been given to the scientific world. Occasionally a laudable exception to this rule has been presented, notably in the contributions of Drs. Coakley and Casselberry to the symposium on sinus disease presented at the last meeting of this Association. Such exhibitions of moral courage are as rare as they are commendable. Few indeed have been offered, either here or abroad.

The misfortune of this is readily apparent. Without a clear and straightforward record of the actual facts it is not possible to discriminate between the better operations and the less successful ones, a question easily settled by comparative statistics.

Thus, in certain cases operated upon, the nasal cavity has assumed a condition to all intents normal as to sensation and function, the patient has been unaware of any unusual change in it and the progress of time has been unmarked by any semblance of accident or relapse.

In other cases the results have not been so fortunate. Sometimes the cure itself has been incomplete; or, again, relapses have taken place, or new foci of disease have developed, sometimes long after every probability of their appearance has passed away.

All these things are important and call for most careful study and attention. It is to be hoped that the near future may give us more information upon them.

But there is another thing which demands attention—namely, the study of the ultimate result of radical sinus operations, both upon the condition of the parts concerned in the operation and upon the general health and comfort of the patient. The ultimate condition of the patient is a consideration which has to all appearances been studiously avoided by all who have dealt with this subject. Suppose extensive, radical work to have been done within the nasal cavity, especially for disease of the ethmoid cells or the antrum of Highmore. Suppose the diseased condition at hand to have been permanently cured. Of necessity, the resection of various important structures, the extensive opening of others, the removal of soft investing and secreting tissues, all of these things imply destruction of parts normally useful, perhaps indis-

pensable, for the proper performance of the natural functions of the part.

No one has yet undertaken to discuss the final condition of patients in whom these destructive operations have been performed.

Granting that they have been necessary and that they have brought about a complete cure of the disease for which they were performed, is the final condition such as to admit of comfort to the patient and of a successful performance of the physiological functions of the parts? In many cases we believe that it is; and indeed it is wonderful to see the amount of damage which may be sustained by the nose without material interference with its usefulness.

On the other hand, the formation of crusts may persist for years after an intranasal operation. The undue widening of the nasal cavities may cause the many unpleasant symptoms due to the too free admission of air. The exposure of hitherto protected cavities, the division and destruction of blood vessels, and the injury of important nerves, with the possibility of subsequent nerve irritation, perhaps long continued and painful in character, are other possible sources of disastrous aftereffect. These and many other objectionable features may persist perhaps during the remainder of the patient's life, seriously compromising his comfort and perhaps affecting his health, the latter consideration a most important one in persons already broken down by the original disease and by the means used for its relief.

A better knowledge of these things is highly desirable, first, because, if the seriousness of the situation has been overestimated, it is well that we should be reassured; secondly, if it has not been overestimated, then the best means for its prevention should be studied and applied.

Most important of all, through a clear understanding of the dangers, difficulties, and discomforts of these more radical cases the profession will be led to appreciate more fully their importance and, by prophylaxis of the causes of acute sinus disease and early recognition and efficient treatment of it when it has once appeared, cure the condition and thus reduce to the lowest possible number the cases which have become fully and hopelessly established as chronic.

If it has not been overestimated, it is time that free discussion and careful recording of cases had taught us the truth.

If extensive multilation of the parts is required by the nature of the disease, or has already been accomplished by it, as in necrosis, then the best possible must be done that the circumstances will permit. If, on the other hand, a less formidable procedure will answer the purpose of a more extensive one, a proper conservatism should certainly be observed. The actual removal of parts means permanent loss; permanent loss implies permanent disability; and permanent disability means the detriment of the patient for the rest of his natural life. Elemental as these statements are, it is not seldom surgically that in the ardor of the present the interests of the future are forgotten, so that it is certainly not without reason that we should ask as to the ultimate results of radical sinus work.

Meanwhile, granting that the answer to this question may be in some measure unfavorable and that in certain cases the whole afterlife of the patient may be affected, it is natural that every effort should be made to prevent inflammatory conditions of the sinuses from assuming their more severe forms, especially where threatened necrosis becomes a prominent feature. That they may be prevented in a fair proportion of instances is entirely possible. The best measure of prevention must generally be a sufficiently correct knowledge of the situation by the practitioner first having the patient in charge.

If the general practitioner who may be called to attend cases of acute inflammation of the nasal sinuses, especially when complicating grippe, will only be prompt to recognize them and careful to apply the means best suited to their relief, the result could often be a speedy and complete recovery.

Again, where the tendency to become chronic has begun to assert itself, painstaking treatment carried on through the natural passages on well-known lines will often effect a permanent cure.

Recognition of the presence of a specific influence and the efficient use of appropriate drugs will sometimes work magically in cases where neglect of this may be the cause of widespread disaster. Indeed, in certain cases of late secondary or of tertiary origin parts apparently beyond recovery may sometimes be saved by constitutional treatment, while the necessity for extensive resection is sometimes not so great as it appears. In severe

cases, when operation is unavoidable, the observance of a reasonable conservatism in the sacrifice of important structures is certainly the least that could be asked. Finally, let us follow up our cases more closely and for longer periods of time, frankly recording all facts relating to them which could in any way be useful to those who must follow in our steps.

Discussion.

DR. EMIL MAYER.—The remarks of Dr. Delavan are certainly very timely and are quite in accordance with the remarks made this morning, which perhaps were not discussed in this paper as much as I think they might have been. It is not only the conditions that Dr. Delavan speaks of in the shape of crust formations and perhaps non-cessation of discharge; there are other conditions. One instance I recall: a lasting neuralgic pain following operation on the antrum of Highmore, where the patient had eventually fully recovered from the condition for which he was operated, but as far as I know retains his pain over his face following the operation. It certainly continued for six months following the operation, and perhaps even longer. He passed from under my observation. So I am not aware as to what the final outcome was, but I think it is all important for us to record the eventual outcome of all these cases for the benefit of those who follow us, and perhaps also to act as something of a restraining influence when that operation is considered.

DR. J. H. BRYAN.—In regard to the subsequent results of my cases, I cannot recall any of the conditions spoken of by Dr. Mayer, that is, the postneuralgic condition. Of course we can conceive in these antrum operations how the infraorbital nerve can be injured, how it can be caught between cicatricial tissue and the neuralgic condition started up. Whether that was such a condition in his case I do not know, but I have not had anything of that kind.

In regard to the crust formations, of course that is sometimes noticed subsequently after the patient has fully recovered from all of the suppurative conditions. These are annoying to the patient, too, and it probably is like the condition we find in atrophic rhinitis, the crust formation there. In a few instances I have noticed it, but it is not of such moment as to cause the patient any very great distress. A little oily spray is sufficient to keep the parts in shape and enable him to evacuate the crusts formed. The tendency, of course, is to ultraradical methods, and I believe if they are going to be followed up generally that we are going to have more trouble in the future than the past by the less radical measures formerly used.

DR. W. E. CASSELBERRY.—In comparison with the evils of

chronic suppurative sinusitis, possible ultimate dryness from the sacrifice of mucosa in radical operating seems of little moment. Aside from a small immediate mortality, the worst of the ultimate results is that the case perhaps has not been cured; the radical operation has been made and still the patient has his disease, the reason for which as a rule is that, though a radical operation has been attempted, it really has not been radical enough. We should consider most carefully before resorting to the radical operation, especially on the frontal-ethmoidal sinuses, as I believe that where the intranasal conservative methods can be made adequate or can be made even to give the patient comparative comfort, such as cessation of pain and sepsis with perhaps a minimum of purulent discharge remaining, it is preferable to undergoing the more radical procedure; but when we have decided to make a radical operation, decided that it really is necessary by reason of failure of conservative methods, the inability or unwillingness of the patient to pursue a prolonged conservative course, the imminence of ocular and cerebral complications or the continuance of pain, sepsis, and other disabilities, then in operating by the radical method we should seek to be so thorough as to leave no focus of infection, caries, or suppurating cavity unremedied. Failures result from saving too much rather than too little. It is true that crust formation and neuralgic pain may possibly follow, but more likely these sequelæ are due not to the operation, but to remants of the disease not quite cured.

DR. DELAVAN.—Dr. Casselberry agrees entirely with myself. The expression "radical as possible" must of course be understood as meaning radical to the extent of effecting a cure. It would be radically wrong to operate with any other end in view. We are both, therefore, in accord. My objection is to the unnecessary destruction of organs and parts which might be retained.

A NEW OPERATION FOR EXTREME CASES OF SEPTAL DEFLECTION, WITH PRESENTATION OF A SUCCESSFUL RESULT IN AN ADULT CASE.

BY J. PRICE-BROWN, M.D.

In the wide domain of general operative surgery the object has always been to remove only organs and tissues that are diseased. When displacement is the principal condition presenting itself, the organ being still histologically normal, it has been the rule to make the restoration of that organ to its normal position the chief object of surgical treatment. This truth is so universally recognized among surgeons that operations upon the various organs and regions of the body are done much in the same way all the world over; the difference in technique being more in relation to the principles of hygiene adopted by the surgeon than the method in which he does the operation.

This, however, cannot be said with regard to that little plate of bone and cartilage which we term the nasal septum. This troublesome and seemingly insignificant little body has a persistent habit of getting twisted and turned out of its normal position—not by its own will but by the will of the surrounding tissues. It is a victim of circumstances over which it has no control, and, being crowded out of the place that it should naturally occupy, it has been pleading with the rhinologist for generations for the restoration of its vested rights.

The pleading in a measure has not been in vain. For more than a score of years rhinologists have been vying with each other in the advocacy of various operations to give the desired relief. I need not enter into an enumeration of these, for their name is legion. Each has been attended by a certain measure of success. Probably all of them have been followed by good results in minor cases and some by excellent results in cases that were extreme. Still the outcome has not been what rhinologists have been so earnestly seeking—a reliable means by which extreme deflection could be readily removed and the cartilaginous septum returned to its normal plane. Any definite method by which this

could be accomplished in a large percentage of cases would have been accepted, it is safe to say, by a majority of surgeons with open arms as the ideal operation; and they would not have turned so enthusiastically toward the removal of the cartilaginous septum as the best method of treatment, particularly when such treatment is a contradiction to the rule already mentioned, namely: to replace and not to excise normal tissue. I refer to the window operation or submucous resection of the cartilaginous septum, which during the last two or three years has been widely accepted as the operation *par excellence* for the removal of extreme septal deflection.

I cannot believe when nature has placed a large triangular or quadrangular septal cartilage in every person's nose, separating with a firm wall the one nasal cavity from the other, that it can be removed in a wholesale manner with impunity, a membranous septum being left in its place. Yet this is the ideal operation of to-day; so ideal that several operators, with marvellous technique, have each removed from fifty to a hundred septal cartilages already. Being skilled men, the large majority of these operations have been successful; that is, the surgeon dissected back the mucous membrane with more or less of the perichondrium from each side, and then removed the cartilage without perforation. Still all the operations of these skilled men have not been without failures. We are told in the *American Journal of Surgery* for June, 1905, that the originator of the modern method had 12 per cent. of permanent perforations; that another operator had 20 per cent, and that yet another, and he one of the most brilliant surgeons of the day, had six perforations out of his first fifteen cases.

In the *Laryngoscope* for April of this year the statement is made that the flap operation is often attended by perforation, and that Killian, one of the most skillful and successful operators, has declared that the management of the lowest part of the septum is "most difficult." Also that in the Hajek operation "the columna is entirely unsupported and may be drawn up into the nose by the contraction of the membranous septum, with very noticeable deformity."

Yet the submucous operation has been so widely practised and so much has been written upon it that every young rhinologist is dreaming of his first ideal operation; and if our established men,

surgeons who have been operating for many years, can so frequently, though unintentionally, make successful punches through the septum, what may be expected of the new man who is simply rubbing his palms together in hope of the opportunity of displaying his brilliancy?

The point might be pressed even further. Is it wise to remove the great mass of the septal cartilage in so many successive cases, even when the operation is brilliantly and beautifully done, resulting in perfect healing of the two folds of mucous membrane, back to back? This operation in its largeness has only been done during the last two or three years. What will be the effect upon these weakened septa in the long years of the future, for many of these patients will live twenty, thirty, or forty years yet? We know how weak an organ the septum is, for we frequently find it perforated even without operation; and when perforated it always occasions more or less distress to the patient. How will these membranous septa stand the aridity of the fevers, the typhoids, and the pneumonias of the future? And will there not be a much larger percentage of perforations among the people during future years if every rhinologist considers it his duty to do a submucous resection in every case of severe septal deformity?

It is in the light of these conditions that I venture to offer still another method of treatment for consideration, one in which the septal cartilage, even in extreme cases, instead of being removed, can be relieved of all tension and replaced with perfect healing in the central plane position. If this claim can be sustained it should be a better operation for the patient than the removal of the cartilage by submucous resection, no matter how excellently or scientifically this may be accomplished.

My former method, which I practised for years, was with a thick saw to make two longitudinal cuts from before backwards through the septum. These were made obliquely from the convex side and were about half an inch apart, passing through both mucous membranes, the lower cut being just above the superior maxillary ridge. This diminished the tension of the septum and enabled the operator with finger and spatula to force the central portion as well as the adjacent margins to their normal position. It did not, however, remove the central resiliency of the large curvature from before backwards. Still, my practice was to insert at once a pure rubber splint of sufficient thickness to retain the

septum in its new position. The rubber, being smooth, aseptic, compressible, and incapable of absorbing germs, was allowed to remain within the nasal cavity undisturbed as long as its presence was needed; cleansing being regularly attended to above and below the splint. In these cases good results were always obtained, but they were not perfect, and the treatment was too prolonged.

Hence, to secure better and quicker results, I have added to the two cuts already named still another one. That is, to remove the anteroposterior tension, I have made a cross-cut completely through both mucous membranes and cartilage, converting the two straight lines into the figure of H. Hence this method of treatment might be called the H operation.

The points I wish to draw attention to in reference to it are these: First: that as the curvature of the cartilage from above downwards gives it a greater width than it could occupy if it were upright in its normal position, the two longitudinal cuts should be so managed as to remove two long slips of the septal cartilage; and at the same time be made at an oblique angle, so that the cut edges can slide over each other. Second; that the cross-cut of the H should be very decidedly oblique, extending at right angles beyond both of the other parallel incisions, and cutting through both mucous membranes and cartilage, so that in replacing the segments, the posterior central segment of the septum will slide forward over its fellow and the anterior one backward.

It matters little how these cuts are made if the principle upon which they are founded is carried out. The long strips of cartilage might be removed either by drill or swivel saw or knife or ordinary saw of unusual thickness or any improved instrument specially constructed for the purpose. The cross-cut can be made by either chisel or knife.

The immediate result of the combined cuts when made completely through both mucous membranes and cartilage is that all tension is removed; that two rectangular flaps are made by the H incisions, the basic blood supply of each being retained, and that they can with ease be pressed into the normal position, their edges sliding over each other. When I first did the operation I imagined that I would require to forcibly fracture the larger posterior flap at its base; but this was entirely unnecessary. The

pieces will bend easily, and, sliding over each other, are readily adjusted, to be retained in position by the use of the invaluable rubber splint, a single one on the convex side being the only one needed.

Through the kindness of a gentleman who came with me from Toronto, I can now present to you a case for examination after successful treatment by this method. His history is briefly as follows:

The Rev. T. R., aged 26, was referred to me for treatment on November 8, 1905. He was perfectly well until ten years ago, when he fell off a ladder from the height of twenty feet, striking his chin and injuring him severely. After his recovery he was troubled with melancholia and lack of power of concentration, both being attributed to the effects of the fall. No one suspected that his nose had been injured. After several years, as partial alienation continued, he went to Texas with the hope that the climate might benefit his health. He remained there for more than three years, when his condition became aggravated, and in March, 1905, he found it necessary to return home.

He next went to England, and last June was referred to Lambert Lack for advice, who at once said that his nose was at fault and that an operation was urgently required. This, however, was deferred until he came back to Canada, when he was placed under my care for treatment.

On examination I found narrow, slit-like nostrils, with almost complete nasal occlusion on the left side, caused by extreme semiglobular curvature of the cartilaginous septum, which in the central part was attached to the corresponding inferior turbinated. On the right side there was a deep, irregular, angular cavity, which was filled by a compensatory hypertrophy of the inferior turbinal, making that side almost as occluded as the other. There was a stale malodor from the secretions, complete anosmia, and some mucopurulent discharge. On using the rhinoscope the posterior end of the septum was found to occupy a nearly normal position.

The first operation was to reduce the size of the right inferior turbinal. This being done, several days were allowed to elapse; then the septum was operated upon at St. Michael's Hospital under chloroform anesthesia; solutions of cocaine and adrenalin being also applied to the convex side to shrink the tissues and increase the space required for operation.

As I proposed doing all the cutting from the left or convex side, I first inserted a wide strip of rubber an eighth of an inch thick in the right or open cavity as a protective. Then the two longitudinal cuts were made with a thick nasal saw, and the

cross-cut to complete the H operation was done by mallet and chisel. All the cuts were bevelled and penetrated completely through the septal cartilage and both mucous membranes.

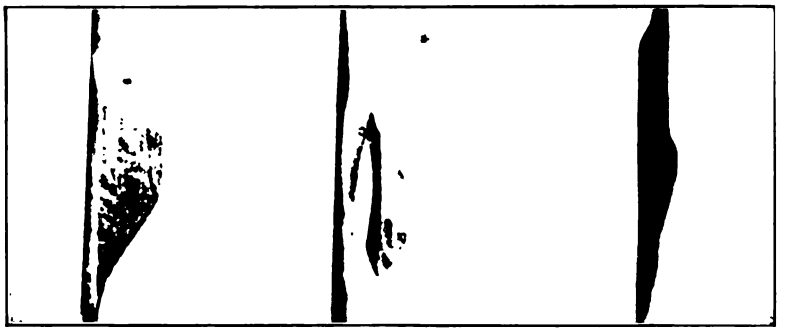
Rubber copies of extreme septal deformity—view from the side.

1. Posterior end. 2. Posterior end. 3. Posterior end.

Anterior end, with dome uncut. Anterior end, unpressed after the H cuts. Anterior end, pressed into place.

Next with a blunt dissector the central part of the convex side was separated from the outer wall and the index finger passed in. The parts were all readily adjusted; the resistance to movement

View from above.



Anterior end, dome uncut. Anterior end, same after H cuts, before replacement. Anterior end, same after replacement.

was slight; and once in place, a broad rubber splint three-eighths of an inch thick was inserted to retain the fragments in position until union could take place.

Bleeding was comparatively slight. The temperature rose the following day to 100 degrees, but the next day it fell again and continued normal throughout the treatment, which consisted chiefly in leaving the splint in position and removing the secretions by the use of aseptic absorbent cotton often enough to prevent accumulation.

There were a couple of slight scissor operations, subsequent to the major one and while the splint was still in position. These were to remove redundant tissue below the site of operation. I did not remove the splint until it came loose, which was on the twenty-fifth day; then it slipped out easily without traction or bleeding. The passage was wide and almost normal in appearance. No ulceration was present and cartilaginous union had taken place. The sense of smell had already returned.

There was, however, a bony maxillary ridge remaining, but I delayed removing it until January 2d, six weeks after the operation upon the septum, lest the use of instruments might weaken the rigidity of the latter. From this time forward progress has been uninterrupted. The patient has free and equal respiration through both nostrils. His septal cartilage is firmly fixed near the center, and there is no probability of it ever occasioning future trouble. His physical health is restored. Hebetude has disappeared, the nostrils have become wider, and he is able to enjoy life better now than he has done for years.

I do not claim that the operation done in this case was perfect; but I do claim that the philosophy upon which the H operation is based is sound; and, considering the many years that the patient is likely to live, the treatment adopted was much better for him than any submucous window operation could have been, and I commend the method to you for consideration.

Discussion.

DR. EMIL MAYER.—I think that Dr. Price-Brown might give his operation a new name and call it the double Asch operation, because he makes a double incision just exactly as was proposed by Dr. Asch years ago to this Association, making a crucial incision. The incision that he makes is carried further, and instead then of making one incision he makes two longitudinal incisions with one horizontal incision. The operation brings us up to the question, as Dr. Brown brought it up here, as to the merits of an operation of this kind for an operation for deviation of the cartilaginous septum, and as to whether one should do a resection operation or any other form of operation for deviation. I have refrained from expressing any opinion for some time for the reason that I was desirous of giving the method of resection

as careful consideration as I could, as I was especially interested in the work that the late Dr. Asch had originated, and with which my name was more or less connected. I have reached a conclusion that we have in resection as practised to-day undoubtedly the best operation that there is for deviation of the cartilaginous septum in a large majority of cases where there is much thickening. Whether we select a method as advocated by Freer, or some modification as advocated by Ballenger, or still another one as by Dr. Yankauer, is a matter of individual selection. I believe that there is still a choice as to operating under certain circumstances. I do not mean that I feel that a resection operation is going to be absolutely available for every single case, but I think these cases should be selected. I myself have been unable to do a resection operation in the very small nostrils of children at the age of seven years, as Dr. Freer assures me he has been able to do. Nor have I been able to make an operation using concentrated cocaine, cocaine powder, on the noses on these operations—painless operation. I have yet to see the benefit for the external deformity in the resection operation. I have always gotten excellent results from the Asch operation in cases where the deviation was due to trauma, and the operation of that kind, or perhaps the operation known as the Watson-Gleason operation, in young children, has in my hands been most satisfactory.

In one instance one patient was being operated on at my clinic for resection, and I do not think I have ever heard such wailing and howling as this patient gave forth. In fact he disturbed the whole clinic and was in a state of extreme excitement. It was found that this man was suffering from the effects of cocaine and it was the cocaine that made him act in this way. He came to me subsequently and assured me that he was not at all suffering from pain at the time, apologized very much for making the fuss, and said he did not know why he did it. He really was maniacal at the time from the effects of cocaine. We must conclude then, that operations of the kind presented here have their value; that general anesthesia is necessary for them; that cocaine is dangerous in the very young, and that resection has many advantages where it may be practicable of performance.

Dr. O. T. Freer.—Dr. Price-Brown has referred to possible sinking of the nasal bridge developing as a remote consequence of the submucous resection after a long time. There has been abundant time for the appearance of such deformities, for the operation has been performed since 1886 by Krieg, followed by Boenninghaus, Killian, myself, and others, hundreds of submucous resections having been done a sufficient number of years ago for these dreaded bad results to at least appear in some cases, if they are going to, yet we hear of no reports of them. I have operated on 171 patients so far and have never seen evil re[illegible] any kind as permanent sequels of the submucous

resection, even when a perforation occurred. A perforation resulting from a submucous resection is a very different matter from one following a wound through all of the layers of the septum, including the cartilage. In the latter case the mucosa retracts, leaving a rim of bared cartilage covered in time with a cicatrix, like a bad stump after an amputation, such a perforation by its very nature being disposed to ulcerate and scab. The perforations due to the submucous resection in contrast to this have borders lined with smooth, redundant mucosa, which abundantly covers underlying cartilage or bone, and is healthy in appearance.

As far as the imediate effect of the removal of the cartilaginous deviation is concerned, as I have often said in articles and discussions, the proceeding does not affect the support of the nasal bridge if the submucous resection be properly done and the portion of the cartilage under the triangular cartilages of the external nose be spared. Severe blows on the nose happening to patients a few days after operations done by me abundantly prove the ability of the external nose to maintain its form in spite of the resection of large portions of the quadrangular cartilage, for in all such cases the nasal profile was not damaged.

I should not be satisfied with the breathing space obtained in Dr. Price-Brown's case, for it only represents about one-half of what could be obtained by a submucous resection.

The submucous resection is eminently suitable for children. It is remarkable how well they endure it and the slight amount of general anesthesia required. I always combine the latter with local cocaine anesthesia, and in many cases the child may be permitted to wake up after enough anesthetic has been given to quiet his alarm, the rest of the operation being conducted under local insensibility alone. A child of 9 for whom I resected a large osseocartilaginous deflection, including the removal of a considerable portion of the vomer, endured the whole operation without complaint and without general narcosis. A youth who submitted to a submucous resection of an extensive nature without objection was frantically restive when I removed an adenoid growth from him a few weeks later, saying that the first operation was painless but the last hurt beyond endurance. The submucous resection, therefore, unless the denudation, as is the custom in some improper methods of its performance, be done with blunt elevators, is not only not a painful operation but is positively a painless one. I elevate the non-adherent portions of covering of the septum with dulled, not blunt, elevators, and the more I operate the more I also resort to keen-edged blades to carry on the denudation where there is the least suggestion of adherence of the mucosa-perichondrium and periosteum to the underlying cartilage and bone. Their use saves the soft parts the tearing and stretching they would be subjected to by the

dull elevator, and thus avoids postoperative inflammation; and, paradoxical as it may sound, one makes fewer perforations with sharp blades than with dull ones.

I know that the submucous resection has come to stay, and, being suitable for all deflections, there is no need of another method for their correction.

DR. C. F. THEISEN.—I cannot see any objection at all to the performance of the submucous resection under a general anesthetic. I perform all of them in children under general anesthesia, particularly children under 15 or 16 years, under ether in the recumbent position. I use a transformer and a small lamp attached to a nasal speculum, which is made by the Rochester Electric Company. In my last two operations performed in that way I did not have any difficulty at all. I must say that I like Dr. Freer's elevators very much. I have not found any difficulty in laying back the mucoperichondrial flap, except in a few cases. I had one or two perforations after my early operations, but I do not think a perforation does much harm. I did not find that it did any harm to my patients at all. Of course in adults the operation under cocaine is better, because you may have the patient sitting up and under good control. But in children I do not see any objection to the use of ether if you have a skilled anesthetist. There are other operations for deviations of the nasal septum followed by good results. The Asch operation is a good operation when the deviation is confined to the cartilaginous part of the septum. When it extends back into the bony part of the septum it will not be followed by as good results as the submucous resection.

DR. J. O. ROE.—I quite agree with Dr. Mayer that Dr. Brown should term his operation a modified Asch operation, because it simply consists in incising the cartilaginous septum. He simply modifies the incisions by making them in a little different shape from the Asch incisions. I quite agree with Dr. Brown, however, with reference to the submucous resection of the septum. I think with him that it is done in a great many cases where unnecessary, where other methods are preferable. In cases where the septum is extremely thick there is no question as to the advisability of the submucous resection operation, but in other cases, where the septum is normally thin but simply bent out of its normal position, there is no more necessity of taking out the whole cartilage and perhaps a portion of the bone in order to straighten that septum than it is to take out the whole femur in order to correct a bowed condition of the leg.

The operation which I devised for the straightening of the septum by simply fracturing it with comminuting forceps makes the submucous resection in these cases entirely unnecessary. By this method we can put the septum in perfect line, and by holding it there with a retentive apparatus for about five days we have

a perfectly straight septum with no liability of a perforation of this septum taking place.

DR. C. W. RICHARDSON.—I was very much interested in the paper Dr. Brown presented, because some months ago I felt very much that the cutting operation, however done, was the operation to be done in all cases of septal deflections. I cannot understand how an operation described along the lines indicated by Dr. Brown can in the healing produce a perfectly straight septum. In many of these cases operations done along that course must get an imperfect result. I have for a long time done the operation of septal correction and had thought that I had reached a fair percentage of success when I attained about 80 per cent. of straight, or fairly straight, septums with fair breathing cavities in my cases. During the last year I have been attempting the submucous work. At first I was very much dissatisfied with it, because, as all beginners in this work will find, however successful they are in the use of instruments, they will make errors in technique, and these errors will be attended with perforations or imperfect results. Latterly I have been won over to the submucous operation, so much so that in the last three months I have done no cutting operation, having done probably twenty submucous operations in that time. All by submucous work during this period has been highly successful—far more successful than I could have hoped to have obtain by the cutting operation; therefore, as an operator along the old line, I would say that I should think the submucous operation preferable in the great majority of cases to the old cutting operations or the straightening operations by the old method. Of course, there are probably a few cases which will be better done by the older method, but the great majority I think will be more serviceably done by the submucous method.

DR. J. W. GLEITSMANN.—If I am allowed to engage your attention for a few minutes, I wish to mention a new local anesthetic which I found from a conversation with several members not to be generally known, and which has little or no toxic effects compared with cocaine. It is novocain, is a white powder, and supplied by Victor Teoechl & Co. It dissolves in water as readily as cocaine, and when blown dry on a mucous membrane is quickly absorbed. I have given it in solution as well as powder in greater quantity with impunity to patients who were unpleasantly affected by small doses of cocaine, and its anesthetic qualities were tested in a submucous septal resection in a boy who suffered no more discomfort than we see with the use of cocaine.

DR. PRICE-BROWN.—I am very much pleased indeed to have so many gentlemen take part in discussing my paper. Still, as I expected, it has received very little support and much opposition. I knew that the submucous resection was the one operation of today, and that a great many, probably the larger number, of the

members present were interested in it. Consequently, instead of discussing the merits of the operation I have suggested, they have devoted their remarks to the window operation. Would it not be well to remember that in semiglobular deflection there is little, if any, thickening in the center? that the tissues are histologically normal? that the cartilaginous portion through the center part is natural, and that the mucous membrane on each side is perfectly normal? You have simply too large a body for the space it was intended to fill; and what I claim is that by the H operation, with its oblique cuts, you can obtain the necessary reduction and replacement. If you have a displacement of the uterus you do not remove it; you try to put it in position. If you have a chronically dislocated bone you do not remove the bone; you try to restore it to its normal place. If we have displaced normal tissue anywhere, nature demands replacement if that can be accomplished. The operation in this case was effected in a feasible way; and instead of the submucous resection taking the first place, I think the time will come when distorted and thickened septa only will be allotted to this method of treatment, while severely curved cartilages will first be reduced in size and then replaced. As I mentioned in this case, the operation was not quite perfect; but before it the patient could not breathe through his nose and was suffering from melancholia. Now he can breathe very well through both nostrils, night time as well as day, and it seems to me that the operation is a good one. It is done much more quickly than the submucous operation, and by inserting the splint until healing takes place the result becomes assured. I have operated in this manner in several cases and the results have all been good. In children from 5 to 7 years of age my operation has consisted of one or two parallel antero-posterior cuts, followed by the insertion of a rubber splint for a week or ten days; the operation being so performed that one part would slide over the other.

In this case, the cross-cut of the H being also made, the posterior flap was a sort of cap, covering all the incisions. There is a little deformity, as some gentleman remarked, on the right side, but that can be removed by another slight operation, if necessary. He breathes perfectly and equally through both nostrils, the melancholia has disappeared, and his health is restored. Gentlemen, I am very much obliged to you for the attention you have given me.

SYMPOSIUM ON DISEASES OF THE TRACHEA, WITH THE FOLLOWING INTRODUCTORY PAPERS.

First Paper.

ABNORMALITIES, HEMORRHAGES, INFLAMMATIONS, AND INFECTIONS.

BY JAMES E. NEWCOMB, M.D.

IN opening the discussion on tracheal diseases, it is very evident that we must place some arbitrary limit on that portion of it assigned to the writer. Otherwise there would be no end to what might properly be presented. This reservation, therefore, must be the excuse for the omission of much pertinent material.

At the outset a plea is made for a more thorough examination of this structure by means of the laryngoscopic mirror than is often and in fact usually made. The introduction of the tracheoscope has by no means eliminated the utility of the mirror. Our fathers in laryngoscopy learned much from its careful use in this direction and, as is the case with all technical procedures, practice makes perfect. It is interesting to note the remarks of Morell Mackenzie on this point. Thus, he tells us, in his first hundred patients he was able to get a good view of the trachea in only 13, in his second hundred in 21, in his third in 29, and in his fourth he was able to see the bifurcation in 47. Our necessities are a strong light and a somewhat higher position of the patient than we employ for ordinary laryngoscopy. The patient's head should be inclined slightly forward, with the neck stretched but without any upward tilting of the chin. The mirror should be held more horizontally than for laryngoscopy and a still more horizontal position enables us to trace the tracheal wall upward from the bifurcation. The upper third of the posterior wall often eludes our vision by any method.

A lateral tilting of the glass brings the corresponding walls into view. Tuerck thinks that pressure on the tube from without may

assist in this particular. It is sometimes of advantage to have the patient sit sideways on a chair and then rotate the head so as to face the examiner.

Anatomy.—No particular advances have been made in our knowledge during the last few years. Zuckerkandl declares that the general statment that the trachea increases in width from above downward is not true. In fact he found the opposite to be the case in two out of four cases examined with reference to this point. It has been shown that islands of ciliated epithelium exist between areas of pavement epithelium. The vasomotor apparatus of the upper portion, in dogs at least, receives innervation through the superior laryngeal nerve, while the inferior sends fibers throughout the entire tube. One case of diverticulum has been reported (Czyhlarz), due apparently to a local deficiency of elastic and muscular fibers. The tracheal axis does not always coincide with the median line of the body. The surgical significance of this fact is obvious. Low down on the left wall a pulsation is usually observed and is referred to the underlying pulmonary artery. The deviation from the normal axis suggests often that some compression may be present. As contrasted with pathological conditions, it may be said that in the latter the parts are more congested, so that the distinction between the rings and pars membrana is lost. Moreover, changes in the patient's position and in the angle of the mirror will generally clear up all doubt. Finally, in spite of the apparent narrowing of the lumen there is no dyspnea.

Malformations.—Semon has reported the case of a girl with the trachea bent just below the larynx from right to left but in opposite direction lower down, so that at the site where one would look for the bifurcation there seemed to be some influence on the outside pressing the tube inward. A strong pulsation was noted at this point. Several cases of tracheocele have been reported in the last ten years. These may arise from persistence of the branchial clefts or from pathological changes. They are generally amenable to operative treatment. Most of them are small and have existed years without symptoms. Gregor mentions the case of a child of 5 months with symptoms of tracheal stenosis, proving fatal. Autopsy revealed an hourglass contraction at the middle of the tube, the pars membrana being lacking at this point.

Inflammations.—Perichondritis occurring about the trachea is

generally secondary to typhoid fever, tuberculosis, syphilis, or other infection. The rings are often bared and may be thrown off in pieces of various sizes. Naturally the tube contracts somewhat after this accident. Chronic perichondritis is a possibility, but is generally masked during life by symptoms referable to superjacent lesions. It occurs most frequently from scleroma, but has been ascribed to simple chronic catarrh. Irregular thickenings of the cartilages may start on a small area and spread through the submucosa, forming flat plates parallel to the rings. Ecchondroses may extend to the upper bronchi, and such have been noted during life. Ulcerations may occur in the trachea from intubation tubes. One interesting and unique case of erythema nodosum has been reported. The patient had a sudden attack of dyspnea, necessitating tracheotomy. Recovery followed. Other dermatoses which have been noted in the trachea are herpes, impetigo herpetiformis, pemphigus, lichen ruber, erythema multiforme, and angioneurotic edema. There is nothing to add under the latter heading to the comprehensive thesis presented last year by Dr. Halsted. Interesting observations have been made by Folina of the effects on rabbits' tracheal mucosa by complete nasal obstruction. The first lesion is the strong vascular congestion with destruction of the vessel walls and their consecutive confluence; then follow destruction of the epithelium, infiltration of the submucosa, and glandular destruction. Later the epithelium re-forms, but the vessels remain shrivelled, while the submucosa reduces itself to a very delicate layer scarcely recognizable.

Acute catarrh is generally associated with that of the larynx and bronchi. It may be propagated from the nose and nasopharynx or from below upward. The general causes of bronchial inflammations apply equally well to the trachea. In fact in many cases of so-called bronchitis the inflammation hardly extends below the bifurcation. The symptoms of an attack need no enumeration here. Considerable swelling of the mucosa can occur without dyspnea. The amount of expectoration depends on the area of mucosa involved. The latter may take on a purplish hue. Ulcers may occur on the intercartilaginous portions. Mucus may remain adherent at one spot for several days and be mistaken for ulceration. Years ago A. H. Smith, of New York, reported one case in which the trachea was lined with a plastic deposit which underwent a low degree of organization and became tough

and fibrous like an old pleuritic adhesion. A laryngo-tracheotomy was done, but a complication of measles, interstitial pneumonia, and diphtheria proved fatal. Sestier has reported two rather doubtful cases of primary tracheitis, the sequel being edema of the larynx. Phlegmonous inflammation almost always comes from the larynx or esophagus. Acute abscess is a great rarity. Chronic catarrh is a sequel of the acute or occurs as a part of chronic bronchitis in old people. The treatment of catarrhal conditions is essentially that of the accompanying bronchitis. There seems to be a general conviction that creosote inhalations check secretion.

A word may be added referring to the occurrence of dysphagia as a symptom of tracheal inflammation. Years ago Hyde Salter called attention to the fact that while the lower extremity of the trachea is fixed, the upper part rises with the larynx in the act of swallowing. The pain is most severe when the elevators of the larynx act most vigorously during this function, that is, when the chin is raised; whereas if the chin is pressed against the neck so that these muscles cannot act with force, little or no pain is felt. Morell Mackenzie, however, records that he never saw this symptom present, and Salter's theory has not been confirmed by laryngoscopic examination.

Inasmuch as tracheal injections figure largely in modern therapeutics, a few words may be devoted to two new methods which have been brought forward. The first is that of Mendel, who says that if the tongue is held outside the mouth as in ordinary laryngoscopy and the patient refrains from swallowing, the pharynx forms a funnel, the only inferior outlet of which is the glottis, for the gullet opening is closed except during swallowing, so that a small quantity of liquid projected against the wall of the pharynx runs down into the air passages. This he styles the "median" method. He prefers, however, the "lateral" method described as follows: The curved cannula is passed with its convexity firmly applied to the base of the left faucial pillar used as a support. The nozzle rests horizontally in the glossoepiglottic groove and is hidden by the base of the tongue. The contents of the syringe are then discharged against the opposite pharyngeal wall with sufficient force to carom, as it were, around it and thus reach the posterior wall, whence they drop into the larynx.

Marangos injects through the nose. He denies that all of the

injection by the Mendel method reaches the trachea. The fluid goes down not merely by its own weight but is drawn down by inspiration. He passes the tube of the syringe through the nose so that the free end just clears the soft palate. In the adult from 12 to 15 c. c. of fluid may be used. The patient breathes normally with the head thrown slightly backward and the fluid is discharged drop by drop, synchronous with inspiration, the discharge being occasionally suspended. The patient can in this way inject himself. Marangos favors the use of gomenol with a little cocaine.

Tracheal Ozena.—During the last decade no small number of cases has been reported in which an ozena was present not only in both the nose and trachea but also in the trachea alone. There is no doubt that this process may be a primary one in the air tubes. We must distinguish these cases from a simple chronic, dry laryngotracheitis by their chronic course and fetid crusts. The source of the odor is still a matter of dispute. Fraenkel, who was the first to describe tracheal ozena, referred the odor to the disappearance of Bowman's glands and their secretions. Zaufal referred it to an abnormal widening of the air passages. Both of these theories originally suggested with reference to the nose have been opposd by Zarniko and Baginsky. Gruenwald has suggested the idea of a substratum of keratosis of the pavement epithelium. The latest idea advanced by Loewenberg and Abel is that the coccus known by the name of the former is not identical with the bacillus of Friedlaender and is not the cause of the disease itself, though it may be the cause of the characteristic odor. As far as we know there is no reason to doubt the essential identity of the lesions in the nose and trachea. The trophoneurosis theory has had a recent resurrection. On this basis, there first results a disturbance of nutrition, though no one can account for the peculiar sequence of events. A metaplasia of the epithelium follows with keratosis, superficial inflammation, crust formation, and then through the inhalation of a certain organism (possibly Loewenberg's) the fetor. In one instance a pseudo-tubercular bacillus was found, although the sputa from the same case were negative. A few cases have been recorded in which the crust formation was so abundant as to threaten life. The possibility of using the tracheoscope in their removal under such circumstances has been suggested. There is some danger of pushing them down in trying to dislodge them. Tracheotomy has been done in one in-

stance by our colleague, E. J. Moure. In one instance the crusts formed a blackish viscous layer reaching down to the bifurcation. Remedies suggested are menthol inhalations and injections, injections of watery solution of naphthol, application of phenol sulforicinate in 30 per cent. solution, injections of guaiacol in albolene, etc. Frequently the mucosa of the trachea becomes quite insensible, and this favors the application of mechanical measures. The accessory sinuses must not be overlooked in our efforts to clear up obstinate cases.

One remarkable case may be summarized. It is reported by Dupond and occurred in the hospital service of E. J. Moure. A sailor was admitted suffering from laryngeal dyspnea. The left cord was immovable in the median line, the right moved slowly. Nasal ozena was found. During the laryngeal examination the cords moved suddenly and crusts were seen in the trachea. Expectorant measures were ordered, but before they could be used the man expelled a mass of crusts the size of a pigeon's egg. Accumulation had led to a diminution of laryngeal sensibility owing to the impairment of the sensory nerves by the atrophic process; hence the absence of a greater severity of symptoms. Respiration was labored, wheezing, and noisy. The voice was low and husky. Under a short course of benzoate of sodium internally and sulphur inhalations the man spoke and breathed freely, other masses having been expelled. Dupond believes that the process advances with greater rapidity in the trachea than in the parts above, owing to its greater size and its rigid walls, which increase the difficulty of expulsion of the crusts and thereby favor their stagnation and decomposition.

A few cases of inflammation have been ascribed to the effects of drugs taken internally. Thus Réthi has reported one case of laryngeal and tracheal inflammation in a patient taking Fowler's solution, dose not stated. The symptoms subsided immediately on the withdrawal of the remedy.

Tracheal Hemorrhage.—During the last few years an interesting series of cases has been placed on record under the varying designations of hemorrhagic tracheitis, hemorrhagic tracheal catarrh, tracheal hemorrhage, etc. The most striking feature about them is that in fully one half the cases the exciting cause has been regarded as influenza. Nearly all of them have occurred in young adults or in persons approaching middle life. They have

been about equally divided between the sexes. Considering the prevalence of influenza during the last fifteen years, such cases are probably more common than reports would lead us to believe. Many physicians have seen cases of hemoptysis in which the lungs, so far as could be determined by our present methods of examination, were healthy and which upon the cessation of the bleeding have been dismissed, while the exact cause of the hemorrhage has remained a mystery. It is easy to dismiss the question by saying that such cases have been those in which the bleeding could be regarded as one expression of the hyperemia which is so often the first manifestation of pulmonary tubercle, so that the diagnosis has not been easy; but too many of them have been kept under observation for a long time to make one believe that they do not deserve a separate classification.

In nearly every case there has been a history of more or less recent influenza and of more than one attack. There has been a tickling irritation in the lower throat and the sensation of a foreign body. There has been a short dry cough, the more intense the more recent the influenza. Unless the latter malady has been still evident there has been no rise in temperature, and such rise if present has been slight. Certainly the charts have presented none of the features of incipient phthisis. The bleeding has come on suddenly and has been repeated at intervals of hours, days, and even months, but in the event of repetition there has usually been a recurrence of the influenza. As a rule, but two or three ounces of blood have been raised; in one or two cases there has been a true bronchorrhagia. Some have emaciated, but this may have resulted from the initial disease. Examination of the chest has given no evidence of involvement of the pulmonary parenchyma. Occasionally in examination of patients with recent influenza there may have been a few moist rales and even traces of recent bronchopneumonia. There has been a distinct absence of the classical signs of incipient tuberculosis. Bacilli have been absent, but this finding has had, of course, only the same relative positive and negative values as under ordinary circumstances.

The laryngoscope has brought to light a peculiar condition in the mucosa of the upper trachea, best seen if the examination has been made just as the bleeding has been passing off. If we examine the trachea during an ordinary subsiding hemoptysis and

are fortunate enough to secure a good view, we generally find it lined with clot or clot-patches throughout its entire length. In many of the cases referred to it has been possible to get a view way down to the bifurcation, and the lower portion has been found entirely clear. The lesion has been confined to the subglottic portion. It has consisted, to use a single descriptive phrase, in a varicose condition of the tracheal vessels. In all the cases reported this definite view has been obtained. At times the vessels have been seen running parallel to the tracheal rings, or perhaps converging toward the subglottic area or irregularly scattered like small leeches over the upper tracheal wall, and blood has been actually seen oozing from them. Rest, opium, and ice pellets have been of service in treatment, and an astringent spray has toned up the vessels, while tonics as strychnine, cinchona, etc., have completed the cure in uncomplicated cases.

As regards the direct relation of influenza as an etiological factor, we must remember that this region is among those affected and primarily so in pretty much every case of the disease. We know that this region is very vascular and it is just at this point that the impact of respiration, phonation, and cough converges. Considering then the local diminution of resistance and the systemic weakening of the influenza, it is natural that such a condition as that described should be brought about. It may follow from other causes than this special infection. In once instance it seemed to be the initial manifestation of cirrhosis of the liver.

It is only fair to note that some of these cases in which tracheal varices have occurred have later passed on to the category of full-fledged cases of pulmonary tuberculosis, so that considerable time must elapse before we are sure of our position in a given case. Therefore we must admit that while tracheal hemorrhage may exist independently of pulmonary disease, it may be present also as a distinct lesion in persons who later develop lung disease. In all the cases reported under the classification a most careful search has been made for tubercle bacilli, but none have been found except in those which have passed on to tuberculosis as above specified. Two reflections are pertinently suggested by the author who has reported the largest number of cases. The first is that greater reserve is necessary in making a diagnosis of pulmonary tubercle in patients who have bleeding, emaciation, slight

fever, and suspicious chest signs; the second is that some cases regarded as cured incipient tuberculosis may have been only recoveries from tracheal bleeding as a sequel of influenza.

Tuberculosis.—In an excellent paper by our colleague, Dr. Jonathan Wright, on tracheal syphilis, published in 1891, he discusses among other topics that of differential diagnosis from tubercle, quoting Vallette as saying that "tuberculosis of the trachea is usually only a feeble episode in the laryngeal and pulmonary trouble which it accompanies." This expresses for nearly every case the true state of affairs. In fact Wright refers to one case of Vallette's as the only one he could find in which the trachea alone was affected. I have gone over the literature of the subject since the date of Dr. Wright's paper and have been able to find notes of three additional such cases. One of these is reported by Hansemann, who found on autopsy on a woman of 73 years tuberculous disease of the trachea from the bronchi up to the larynx but no trace whatever of tubercle in other tissues. In the discussion of this case Schmorl related the histories of two others with the same limitation of lesion. One was found in a man dying from typhoid fever, the other in a child of 8 years, the exact cause of death not being given. Cases with coincident involvement of the larynx and bronchi are matters of daily occurrence. Tracheal ulcerations here are more marked on the posterior wall and are often found in advanced cases when the patient becomes bedridden. This is doubtless due to the long continued contact with the mucosa of a tenacious agent such as bacilli-laden sputum. Naturally from proximity the upper portion of the trachea suffers more than the lower. The pathological changes present no peculiarities. The tube is generally thickly coated with mucus, though it may not be produced at this site. The ulcers are generally chronic but may run an acute clinical course, fuse, and become of considerable size. In one of Schroetter's cases the entire surface from the sixth ring to the bifurcation formed one large ulcer. Ulcerations may penetrate the wall of the tube, but unless they so do they add no especial symptoms. A view of the trachea is often impossible, owing to the swelling of the laryngeal structures. When the former becomes infected in its lower parts such infection probably comes from the bronchial glands. Weichselbaum saw one case in which perforation took place into the trachea and esophagus from ex-

tension from the glands named. Schroetter has seen cases of involvement of the upper portion of the tube which he could explain only on the same theory of infection from the glands.

No enumeration of the features of tuberculosis of the trachea should omit reference to the rare tuberculoma first described by our associate, Dr. J. N. Mackenzie, nearly twenty-five years ago. I am greatly indebted to him for an interesting personal communication giving his own experience in this direction. Several other cases purporting to be similar have been reported, but the majority of them have either been wrongly classified or the evidence adduced in their favor is not convincing. By the term used Mackenzie refers "not simply to a lesion containing the bacillus but to a distinct definite characteristic tumor formation covered by unbroken epithelium and consisting of a mass of miliary tubercles set in a vascular network of connective tissue and exhibiting all grades of tubercular degeneration up to cavity formation." It will be observed that this condition is sharply defined from mere mound-like infiltrations. In the communication referred to, Dr. Mackenzie states that he has seen, in all, three cases in which the diagnosis was established microscopically beyond a doubt and two others in which no histological examination was made. To these rigid standards the loose statements of several other writers do not conform, and their diagnosis of their respective cases cannot be accepted, still less their claims to have been the discoverers of the condition.

Syphilis.—The following may be enumerated as the specific lesions which may involve the trachea: catarrhal inflammation, erythema, condyloma, gumma, ulceration, perichondritis, and cicatrices. Catarrhal inflammation has no special appearance or symptoms, and a diagnosis of such as a specific manifestation could be made only in the presence of other and conclusive evidences of this infection. Of the so-called secondary infections erythema and condyloma are rarely observed, probably because they are overshadowed by the extreme changes in the larynx. Erythema might cause irritation, but no symptoms would arise from condyloma until ulceration occurred. In one case reported by Harrison Griffin, a broad projecting granular mass was visible upon the anterior wall immediately under the cords, running backward about one inch and causing considerable narrowing of the lumen. It was of a reddish color with a skin-like secretion.

It had sharply defined limits and its upper surface was irregularly fissured. Under the internal use of the iodide and inunctions over the thyroid cartilage it disappeared in three weeks. Condylomata are not always reddish, but sometimes appear as white spots or as thickenings with superficial ulcerations. Circumscribed gummata are rare, especially in the upper portion of the tube. Parker has reported the case of a boy of 15 years with inherited syphilis who on autopsy showed dense fibrous tissue in connection with the mucosa and submucosa. At one point the lumen was reduced to a diameter of one quarter of an inch. Tracheotomy had been done and the fistula closed later. Death resulted from catarrhal pneumonia. The effects of the inflammation began somewhat abruptly one and one half inches above the bifurcation and increased downward. Extreme interstitial inflammation compressed both bronchi and alveoli. The smaller tubes and alveoli were full of fetid pus. Beale notes that such forms of obstruction always occur at the lower end of the tube. Gerhardt explains this localization by the fact that the lower parts are more liable to injury by cough and by the additional fact that the pulsations of the pulmonary artery always keep the tracheal wall in a constant state of vibration. Next in frequency as to site of lesion is the upper portion by direct extension from the larynx.

Infiltration may come on years after the body has been free from a syphilitic lesion. The process seizes on the cartilages and leads to inflammation and necrosis. If not treated we have the usual sequence of softening, ulceration, and destruction. Infiltrations are often ring-like. Membranes are more rare than in the larynx from the same cause. Here may be cited the remarkable case described in the Candidate's Thesis of our President, Dr. Gleitsmann, presented to the Association in 1880. His patient was a woman of thirty-two years who presented along with various other lesions the "seeming appearance of a second glottis far below the normal one. Two dark red symmetrical membranes ran horizontally from back to front of the trachea with a very small longtitudinal opening between them, which was wider posteriorly than anteriorly. They remained immovable during respiration and phonation and were localized in the region of the fifth or sixth tracheal cartilages. Their surfaces and free margins did not show any signs of ulceration. It was impossible to

determine their vertical thickness." Under systemic and long-continued treatment these adventitious bands entirely disappeared.

With a desire not to trespass on the ground of other participants in this discussion I omit reference to the various contractions and stenoses which may result from specific disease. Ulcerations sometimes lead to deplorable results. Diffuse peritracheal and bronchial syphilomata have been noted. The clinical aspects of these various lesions are modified by the fact that the bronchi and lungs are often synchronously affected. Various forms of paralyses are simulated by the results of pressure and contraction. Downie declares that hereditary syphilis is more often the cause of ulcerations here than is acquired disease. The symptoms comprise in varying combination hemoptysis, cough, dyspnea, and stridor. Often the cough and sputa suggest tuberculosis, the breathing and respiratory spasm laryngeal stridor. Ulceration may perforate the aortic arch. In a general way infiltration and gummata give no symptoms until narrowing of the lumen occurs. Ulcers may cause cough and pain. Sputa are mucopurulent and purulent. In the later stages of infiltration we have reaction in neighboring parts. Rings and membranes give evidences of stenosis. In marked stenosis we have fever and symptoms of pneumonia.

The diagnosis is generally easy. The systemic history is taken into account and a careful examination should be made of the entire body for stigmata of syphilis. If the larynx is free examination is generally easy, because it opens widely and the epiglottis is instinctively elevated. Involvement of the larynx often precludes a view of the trachea, and the diagnosis must be then made by exclusion. Here as elsewhere the iodide often clears up many obscurities.

Differential diagnosis is called for from tuberculosis, scleroma, ulcers of other varieties, tumors, and foreign bodies.

Scleroma generally begins in the nasopharynx and spreads downward, generally affects a large area, has no ulcers, and runs a long course, even over decades.

In tuberculosis we almost always have ulcers in the larynx, are helped by the results of chest examinations and by the finding of bacilli in the sputa. Tuberculin injections may solve the problem.

Of tumors the most common are fibromata and papillomata. Glandular masses and malignant disease resemble gummata.

Foreign bodies are often overlooked because covered with granulations.

The treatment is that of the specific disease in general together with such topical applications and mechanical measures as the individual case may demand. H. von Schroetter has recently employed the tracheoscope in one case for locating a specific lesion, which was found at the bifurcation and was removed by internal medication, as was verified by subsequent examination. He warmly commends the use of this instrument in order to make our diagnosis and treatment more accurate.

As a practical matter it may be observed that it is hard to separate syphilis of the trachea from an accompanying lesion of the bronchi. Reference may be made here to the valuable paper of L. A. Connor, in 1903, on tracheal syphilis. His statistics are of interest. He has analyzed 128 cases recorded in literature and occurring in his own practice, finding that 20 of these were gummata, 51 ulcers, while of endotracheal connective-tissue new growths distinct scars were noted in 47 and diffuse thickening in 13. Fibrous peritracheitis was present in 8. The trachea alone was involved in 56 per cent., trachea and bronchi in 33 per cent., and the bronchi alone in 11 per cent.

Out of Connor's 128 cases there was a mortality of 76 per cent. Of 58 cases in which the immediate cause of death was given, 19 died from pneumonia, 4 from perforative hemorrhage, 11 from sudden paroxysmal dyspnea, and the remainder from gradual exhaustion. Of 29 rationally treated, 15 were cured, 11 improved, while but 3 failed to respond to treatment.

A word may be added concerning scleroma. Inasmuch as the programme for to-morrow contains a paper on this subject, which will be thoroughly dealt with, no reference is made here to the histology of the disease. Suffice it to say that while its occurrence in the trachea is generally secondary to that in areas above, it may here occur as a primary lesion. According to the stage to which it has progressed we have dyspnea, crust accumulation, cough, scarring, and stenosis. There is no specific treatment. Symptoms must be met by suitable measures, which embrace inhalations, mechanical removal of crusts and infiltration deposits, and the various surgical measures which are proper for stenoses from other causes.

Second Paper.

TUMORS OF THE TRACHEA.

BY CLEMENT F. THEISEN, M.D.

BRUNS, in his very complete article on the neoplasms in the air passages (trachea), states that the first observation of a tracheal tumor was in 1767, by Lieutaud. The patient in whom it was observed, a boy, died of a sudden attack of dyspnea, and a polyp with a long pedicle, which had been carried into the glottis by the air current and had caused the sudden death, was found. After the introduction of the laryngoscope the reports of tracheal tumors became more frequent.

Tuerck, in 1861, was the first to observe a tumor in the upper part of the trachea in the laryngeal mirror. After him cases were reported by M. Mackenzie, Schroetter, and Stoerk. This rare occurrence of tracheal tumors is in great contrast to the frequency of laryngeal tumors, as Semon in 1889 collected over 10,000 cases of benign laryngeal neoplasms (Bruns). According to these figures, tracheal new growths as compared to those occurring in the larynx would be less than 1 per cent., or, in other words, the relation would be approximately 100 laryngeal growths to 1 in the trachea.

Bruns' personal observations are somewhat different, as he observed 300 laryngeal growths to 7 in the trachea.

Moritz Schmidt, out of 42,635 cases of diseases of the upper air passages, observed 2,088 new growths, of which 748 were laryngeal and only 3 tracheal.

Bruns states that the slight tendency of the trachea to the development of new growths may be explained by the fact that the trachea, which is a simple, rather rigid, smooth tube, has practically only the passive function of the passage of air, while the larynx has a complicated structure, and such a function that its parts are in almost constant motion. This also explains perhaps the slight tendency of the trachea to primary catarrhal in-

flammations, and the fact that the majority of tracheal tumors are in the upper part of the trachea and the smallest number in the middle, because particularly this part of the trachea is so well protected from irritation of all kinds.

In order to study the subject, the statistics of the different writers had to be consulted. The valuable theses of Mueller,[3] Koch,[1] Orth,[4] Schroetter,[5] Lemoine,[7] Scheuer,[6] and Bruns' monograph[8] were of great assistance in preparing this paper. The monograph of J. Solis-Cohen[41] in Ashhurst's Encyclopedia was also used. A good many of the original reports of cases were also consulted.

Granulation tumors resulting from tracheotomies and the wearing of tracheal cannulas, and the syphilitic or tuberculous granulomata, were not considered genuine tumors, and were not included in this paper. The writer's paper is based on a study of most of the authentic cases of primary tracheal tumors in the literature, 135 cases in all. Other cases have been reported, but in some of them there was some doubt of the diagnosis and in others the data were insufficient.

Of the 135 cases 89 are benign and 46 malignant.

BENIGN NEOPLASMS.

The benign new growths occurring in the trachea are about the same as those observed in the larynx. The following varieties occur in the trachea: the fibroma (polypus, fibrous polypus), the lipoma, the papilloma, the ecchondroma and chondro-osteoma, the adenoma, the intratracheal goitre or struma, and the lymphoma. Of the malignant neoplasms only the sarcoma and carcinoma have been observed occurring primarily in the trachea.

Intratracheal Struma.—Considering first the benign growths, we find that the intratracheal struma is one of the rarest as well as one of the most interesting forms.

Cases of intratracheal struma have been reported by Ziemssen,[78] Bruns,[74] Heise,[75] Roth,[77] Paltauf,[78] Baurowics,[80] Freer,[81] and Theisen.[82]

Three cases, those of Neumayer[71] and Frankenberger,[72] reported as cases of struma, have not been included in this list, because the diagnosis was not proved in any of the cases.

Abstracts of the reported cases of intratracheal struma will not

be given, because they were published in the writer's original paper, "A Case of Intratracheal Colloid Struma: Operation," in the *American Journal of the Medical Sciences,* June 1902.[82] A

Fig. 1. Author's case of intratracheal struma.

full report of the writer's case was published at that time, with the histological diagnosis, which was "colloid struma originating

Fig. 2.

in thyroid tissue situated beneath the submucosa of the trachea."

It may be of interest to mention at this time that the tumor, which was removed by tracheo-fissure, November 16, 1901, and

which extended downwards along the posterior wall of the trachea from the first ring for a distance of 5 cm., has not returned. I examined the patient a few months ago, and found the trachea clear with the exception of a little thickening where the tumor had been attached to the tracheal wall. Fig. 1 shows the tumor as it looked on laryngoscopic examination, and Fig. 2 shows a drawing of a section, low power.

As the etiology of this class of benign intratracheal growths has been so well studied, I will consider it rather thoroughly. Up to the time of Paltauf's[78] investigations it was, however, rather obscure.

The two theories as to the origin of this most interesting form of tumor that have received the most consideration are those of Bruns[79] and Paltauf.[76] Bruns and Heise, the chief exponents of the embryonal theory, held that in intrauterine life a small accessory thyroid lobule from aberrant embryonic rudiments of the thyroid gland ("Angeborene Verlagerung von Schilddruesengewebe") must have, in such cases, been present in the fœtal larynx or trachea. This lobule, developing about the time of puberty, resulted in the true intralaryngeal or tracheal so called "accessory thyroid tumor." Paltauf was able to prove in his case by microscopical examinations that this theory was not tenable. In his case there was a connection between the intratracheal growth and the thyroid gland externally. The thyroid was so firmly attached to the cricoid cartilage and upper three tracheal rings that it could not be separated from them. The space between the cricoid and first tracheal ring, and a portion of the external lateral lobe of the thyroid, which was firmly adherent to the cartilage at this point, were examined microscopically, and he was able to prove positively that the thyroid tissue had penetrated (through the interstitial membranes) to the perichondrium and submucosa on the inner surface of the trachea, the cartilage itself remaining intact. This observation of Paltauf's is the first instance on record of normal thyroid gland tissue penetrating to the interior of the trachea, although Orth,[86] in his "Pathological Anatomy," makes the statement that "strumas, but particularly malignant neoplasms, could penetrate into the air passages."

Paltauf's conclusions, that these tracheal tumors springing from thyroid tissue do not owe their origin to an intrauterine deposit of thyroid tissue, are of great interest. They should therefore

not be called accessory thyroid tumors. They originate in *extra-uterine* life by penetration of the gland tissue between the cricoid and thyroid cartilages, between the cricoid and first tracheal ring, between the upper tracheal rings, and through the interstitial tracheal membrane itself, from without. When this occurs it should be considered as a direct extension of an enlarged thyroid gland—a parenchymatous struma. Proof of this assertion is that the thyroid gland has really grown fast to the cricoid cartilage, interstitial membranes, and upper tracheal rings. This abnormal adhesion can neither be explained by pressure, nor by an inflammatory process, but can only have occurred during the formation and development of the thyroid gland, and only in the way that the fœtal gland, in these cases, must be united with the perichondrium of the cartilage and the interstitial membranes.

Gruber's investigations,[86] perhaps, would give additional support to Paltauf's theory. He found, after examinations of many Russians and Bohemians, that there was often an accessory or really an extra lobule extending downward from the lowest posterior margin of the lateral lobes and lying very close to the trachea. These extra lobules may also lie in the cricothyroid space. The ouly parallel cases that possibly give some support to Bruns' theory are those observed by Streckeisen.[87] He found on sections through the hyoid bone seven times the so-called glandulæ intrahyoidea, that is, thyroid tissue was shut in the bone. He believes that this was shut in during the ossification period.

In my own case it could not be determined during the operation whether the left lateral thyroid lobe, which was enlarged, was adherent to the trachea or not. The isthmus was not, because in ligating it the ligatures could be readily passed between it and the trachea. It is a rational deduction, however, from the fact that the intratracheal growth was really part of the tracheal wall, and, springing as it did from the posterior and left lateral wall, that in this case, too, the intratracheal tumor was really an offshoot from the left lateral thyroid lobe.

An analysis of the ten cases of this class of tumors brings out a number of interesting points: (*a*) The location of the tumors in all the cases, with the exception of Bruns' last case, was characteristic. They were all situated in the lower part of the larynx and upper part of the trachea and attached to the lateral and posterior walls. Bruns' last case was the only exception to this

rule, the growth being attached to the anterior wall. (*b*) This point decides another interesting fact before mentioned, that these tumors, for this reason, should not be called accessory thyroid tumors, because they are really offshoots from the thyroid, as proved in the majority of the cases by the adhesion of the thyroid to the tracheal wall, and in Paltauf's case, microscopically, by the infiltration of the interstitial membranes with the follicles of the thyroid gland. (*c*) They were all observed early in life, from the fifteenth to the thirty-third year, with the exception of Roth's case[7] (the fortieth year). (*d*) A goitre of moderate size was present in all except in one of Heise's and in Freer's case. (*e*) They occurred in both sexes—three in males, and seven (including the author's) in girls and young adult women.

Papillomata.—The tracheal papilloma is one of the commonest benign tracheal growths, and usually occurs together with multiple laryngeal papillomata. The majority of the cases of tracheal papilloma occur in children.

Six of the recorded cases of tracheal papilloma were undoubtedly congenital, because the children were hoarse and there was dyspnea from birth.

Bruns has found the same to be true of laryngeal papilloma in children, about one fourth of the cases being congenital. (Bruns, P. Die Laryngotomie z. Entfernung intra-laryngaler Neubildungen, Berlin, 1878, S. 179).

Cases of tracheal papilloma have been reported by Davis Colley,[11] Maissonneuve,[10] Bruns,[9] Schroetter,[12] Mackenzie, M.,[13] Labus,[15] Mackenzie, M.,[14] Butlin,[16] Labus,[17] J. Solis-Cohen,[18] Schaller,[19] Teschendorf,[20] Chiari,[21] Siegert,[22] Weil,[23] Stoerk,[24] Mackenzie, M.,[26] Stoerk,[25] and Krishaber.[27]

A study of the reported cases shows that in a little less than one-third of the number the papillomata were confined to the trachea, and occurred mostly singly, varying in size from a pea to a pigeon egg. They are usually found in the upper part of the trachea and in the majority of the cases are attached to the anterior wall, although they also occur on the posterior and lateral walls. Siegert[22] has reported a papilloma as large as a pigeon egg, close to the bifurcation, and Stoerk[25] has also reported a case in which the growth was close to the bifurcation.

Chiari[21] diagnosed a case with the laryngeal mirror in which the growth was attached to the posterior wall at about the tenth

ring. Maissonneuve,[10] in 1856, at autopsy, found in the trachea of a boy aged ten years, numerous reddish-white vegetations, which extended upwards to the vocal cords. They had started about two years before death, with catarrhal symptoms of the air passages.

Stoerk[24] observed another case in a man, aged 22 years, in which multiple papillomata were present in the trachea at the level of the third ring, with numerous laryngeal papillomata.

Labus[45 48] has reported three cases removed per vias naturales. In the first case there were papillomata of the left vocal cord, and others in the trachea (fifth to eighth rings). Removed with forceps, but recurred every four or five months. Final cure was obtained.

Second case: Small growth at level of third tracheal ring in boy, 13 years old. Removed with forceps. No recurrence after five years. Although the diagnosis of fibrosarcoma was made in this case microscopically, it was probably not malignant, from the fact that there was no recurrence after an endotracheal removal.

Third case: Tracheal papilloma, man aged 63 years, at the level of the fifth ring. Removed with forceps in different sittings.

Mackenzie, J. N. ("Transactions American Laryngological Association," 1898), described tuberculous tumors in the trachea, which at times take the form of papillomata.

Bruns[9] has reported two cases of tracheal papilloma in children aged respectively seven and ten years, occurring in conjunction with multiple laryngeal papillomata. In the case of a child of 5 years dying of a suffocative attack (Teschendorf[20]) a mass of papillomata extending from the epiglottis to the bronchus was found, and in another case, that of a child who had also died during an attack of suffocation, the trachea at autopsy was found to contain numerous papillomatous excrescences extending almost to the bifurcation. Reported by Schaller.[19] Sudden deaths of this kind have occurred mainly in children; the only adult case of which I could find any record was the one reported by Mackenzie, M.[26] Sudden death was produced in this case by a papilloma as large as a bean.

Lipomata.—Only one case of genuine lipoma has been reported, by Rokitansky,[36] Fig. 3. At the autopsy of a man, aged 85 years, a lipoma as large as a hazelnut was found in the left bronchus.

In another case, that of Chiari,[35] a primary bronchial tumor

turned out to be a mixed lipoma and adenoma. The case was that of a woman aged 68 years, who died of emphyzema. It was made up mainly of fatty tissue.

Lymphomata.—I could only find records of two cases of lymphoma of the trachea. They were reported by Clark[37] and Vogler.[38]

In Clark's case, that of a woman aged 75 years, a tracheotomy which resulted in the death of the patient had been performed for urgent dyspnea. The growth was found at autopsy.

In Vogler's case, that of a girl aged 19 years, a round tumor as large as a cherry, attached to the lateral tracheal wall, could be

Fig. 3. Rokitansky's case of lipoma of the trachea (after Schroetter).

seen with the laryngeal mirror. It was removed by tracheofissure.

Adenomata.—Seven cases have been reported: by Radestock,[29] Chiari,[31] Mayer,[30] Scheuer,[28] Kolisko,[32] Paltauf,[33] and Rosenheim.[34]

They are round tumors, originating as hypertrophies of the mucous glands. They are as a rule only slightly movable, and have their seat in the posterior wall of the trachea.

In Rosenheim's case, that of a young woman aged 23 years, a small, red, not movable tumor was seen in the upper part of the trachea. It was removed by tracheotomy and was found attached to the cricoid and upper tracheal rings. Diagnosis, colloid fibroadenoma.

Scheuer reported the case of a woman aged 56 years, in whose

trachea a round tumor about the size of a cherry was found on laryngoscopic examination. It was attached to the posterior wall, by a thick pedicle, at the level of 6-8 rings. Removed by tracheotomy. Kolisko and Chiari have reported cases of adenoma of the bronchi. Chiari's case occurred in a man 73 years of age, who had died of tuberculosis.

Fibromata (fibrous polypi).—Cases of this kind have been reported by Rokitansky,[51] Stallard,[54] Eppinger,[55] Tuerck,[52] Maissonneuve,[53] Mackenzie, M.,[56] Fifield,[57] Mackenzie, M.,[58] Crutchley-Mackenzie,[59] Ingals, E. F.,[60] Avellis,[64] Braun,[63] Masini,[62] Lewin,[61] Makenzie-Johnston,[65] Oazmann,[66] Bidwell,[67] Jurasz,[68] Bockenheimer,[69] Fournie.[70]

Rokitansky in 1851 reported the first pedunculated fibroma, situated at the bifurcation of the trachea. He did not describe it accurately.

I will give brief abstracts of only the most interesting cases.

Tuerck reported the case of a fibroma of the trachea found at autopsy. The patient a man, aged 37 years, had died of tuberculosis. It was situated in the upper part of the trachea, and was attached to the posterior wall. Stallard found in the trachea of a man aged 40 years, who had died during an attack of suffocation, a polyp as large as a tonsil. It had been attached to the anterior wall of the trachea high up.

In Eppinger's case, a man aged 23 years, who had died suddenly, a round tumor as large as a hazelnut was found on the posterior wall of the trachea 4.5 cm. above the bifurcation. The diagnosis was made microscopically.

Mackenzie has reported four cases of tracheal fibroma, all the cases he observed.

In the first case, man aged 41 years, the growth was attached to the anterior wall of the trachea at the second ring. In the second case, a woman aged 22 years, the tumor was attached to the posterior wall at the third ring. In an attempt to destroy this with the cautery both vocal cords were injured.

In the third case, a man aged 37 years, and in the fourth case, man aged 45 years, the polypi were attached to the anterior wall, in the one at the second ring and in the other about the fourth ring.

In two of Mackenzie's cases the polypi were destroyed with the cautery. In the fourth case the patient refused operation and

died suddenly a few months after returning home, probably of asphyxia.

Ingals has reported a case of tracheal polyp in a man aged 60 years.

In a case reported by Lewin, in which a fibroid polyp was attached to the posterior wall of the trachea, a tracheotomy was performed, and the patient wore the cannula twenty-four years. He refused any other operative procedure.

Mackenzie-Johnston and Oazmann have also reported cases of tracheal polypi. In Mackenzie-Johnston's case, the growth was removed by tracheotomy, and in Oazmann's case it was removed endotracheally.

Altogether I could find records of 24 cases of tracheal fibroma, although there are undoubtedly more. Of this number 15 were pedunculated and 9 were attached by a broad base. They were situated about equally in the upper and lower parts of the trachea, and attached to the anterior and posterior walls in about the same number of cases.

In the majority of the cases they occurred in middle life, only three cases having been observed in children between the fifth and fourteenth years. In eight of the reported cases sudden death from suffocation occurred.

Ecchondromata and Chondro-osteomata.—The solitary cartilaginous tumor of the trachea is almost unknown. Only one case could be found, that of Berg (Virchow, Jahresber. 11, S. 206, 1890). He observed a tumor as large as a nut at the fifth tracheal ring. It was removed by tracheofissure, and was found to be made up of cartilage.

Other ecchondromata and osteomata have been reported by Solis-Cohen,[41] Virchow,[40] Ganghofer,[39] Chiari,[42] Heymann,[43] Steudener,[44] Hammer,[45] Wilks,[46] Chiari, O.,[47] Schroetter,[48] Mischaikoff,[49] and Klebs.[50]

Very little is known in regard to the genesis of this interesting class of new growths.

H. Chiari,[42] in 1878, described the formation of osteomata in the trachea of a man aged 25 years, who had died of tuberculosis.

The first case of this kind was probably described by Wilks,[46] in 1856. In this case, that of a woman aged 38 years, there was a formation of bone in the mucous membrane of the trachea. His patient died of pulmonary tuberculosis, and at the autopsy

the whole inner surface of the trachea was found covered with small movable bony plates, which were attached to the anterior wall. No connection could be discovered with the tracheal rings.

Heymann[43] has reported a similar case in a woman aged 61 years. In his case a tracheotomy was performed and later a thyrotomy, resulting in the death of the patient.

Five other cases have been reported by Hammer.[45]

J. Solis-Cohen[41] found in the trachea of a tuberculous patient, after death, a considerable number of minute closely aggregated ecchondromata beneath the mucous membrane.

As will be seen from a consideration of these cases, such bony and cartilaginous formations in the trachea are practically always multiple. They have all occurred in adults between the twenty-fifth and sixtieth years.

The causes of death in cases in which this condition was found were seven times tuberculosis, four times pneumonia, and, in one case each, laryngeal perichondritis, meningitis, brain tumor, and carcinoma of the uterus. Tuberculosis would appear to play rather an important role etiologically, although in what way has not been determined.

Mischaikoff's investigations[49] have perhaps helped to clear up the origin of these tracheal chondro-osteomata. He claims that they do not develop from the ordinary connective tissue of the mucous membrane, but from strands of connective tissue springing from the perichondrium. This is brought about, he states, by an anomaly in the development of the tracheal cartilage.

MALIGNANT NEOPLASMS.

Carcinomata.—Primary carcinoma of the trachea occurs most frequently as a medullary carcinoma and exceptionally as a cylindroma (Koschier).

Langhans has shown in a number of cases that these neoplasms originate in the mucous glands of the trachea.

Bruns[104] has reported a case that shows a probable malignant change in an intratracheal struma. As this is the only case of which I could find any record, in which an extensive resection of the trachea was performed, I will report it rather fully.

The patient was a man aged 31 years, who had suffered from slowly increasing dyspnea for many years. On laryngoscopic examination the trachea was seen to be filled with rounded, nodu-

lar masses attached to the posterior wall. Bruns resected the trachea, including eleven rings and extirpated the growth. The patient lived for six years. The histological examination showed it to be an adenocarcinoma, probably an intratracheal malignant struma.

Tracheal cancer appears to favor the male sex; out of the cases collected by the writer, men were afflicted about twice as frequently as women.

The youngest patient was 28 years old, the average age, however, being from the fiftieth to the sixtieth year. Many more cases occur between these years than between the thirtieth and fiftieth.

Tracheal cancer assumes a number of different forms. Langhans,[90] who in 1871 was the first to describe a primary cancer of the trachea, also first described the infiltrative form of tracheal carcinoma. His patient a man, aged 40 years, had suffered for years with symptoms pointing to a stenosis of the right bronchus. The true condition was not, however, determined during life. At the autopsy the lungs were found normal, the bronchial glands enlarged and melanotic. A swelling was found in the lower part of the trachea, extending upwards for about 4 cm. from the bifurcation. There were also nodules at the bifurcation, extending into the right bronchus for a distance of 2½ cm. The bronchus itself was narrowed by a number of warty like elevations attached to its walls.

M. Mackenzie[91] has reported one case also discovered at autopsy. In the trachea of this patient, a woman aged 57 years, an ulcerated growth occupying the middle third of the trachea was found. On microscopical examination, the growth was found to be an epithelial cancer.

In Schroetter's case,[92] a man aged 58 years, a tracheotomy was performed. At autopsy a nodular mass was found in the trachea, extending from the first to the ninth rings. A microscopical diagnosis of carcinoma fibrosum was made.

Oestreich[100] observed in V. Leyden's clinic a primary carcinoma in the trachea of a woman aged 28 years, the youngest patient on record.

Another case of carcinoma at the tracheal bifurcation was reported by Ehlich,[101] in a man aged 65 years.

Koschier[102] has reported two cases (cylindroma), both attached

to the anterior wall, and another case,[108] a woman aged 40 years, in whose case a carcinoma was removed per vias naturales with a specially constructed sharp spoon of Stoerk.

Other authentic cases have been reported by Hoffman,[106] Delafield,[89] Gibb,[93] Klebs,[95] Reiche,[98] Fischer,[99] Boschi,[105] Koerner,[109] Pick,[111] Hinterstoisser,[112] Schmidt,[113] Pogresbinsky,[110] and Sabourin.[109]

The writer would add still another case of his own to this list. The patient, a man 58 years of age, presented himself for the relief of urgent dyspnea. With the laryngeal mirror a mass could be seen filling the upper part of the trachea and extending to the subglottic portion of the larynx. A tracheotomy was performed with cocaine. No other operation could be performed, because there was already involvement of the glands of the neck. The patient lived about four weeks after the operation. A microscopical diagnosis of carcinoma was made.

In Boschi's case, a man aged 60 years, a tumor extending from the bifurcation 5 cm. upwards was found. It extended through the trachea and was attached anteriorly to the posterior wall of the ascending aorta as well as to the arch.

In all I could find records of 27 cases, making with my own case 28 cases.

The favorite seats for primary tracheal cancer are the upper parts of the trachea and the lower parts close to the bifurcation. The middle third is rarely involved.

In the majority of the cases the posterior wall is involved, while the anterior wall is not so frequently implicated.

The writer has only considered cases of primary tracheal carcinoma. No mention will be made of cancer secondary to laryngeal or esophageal cancer.

Carcinoma of the thyroid gland also frequently infiltrates the tracheal wall.

Sarcomata.—Only primary sarcomata will be considered. In three cases, however, those of Jurasz,[131] Pieniazek,[128] and Wright,[130] the larynx was also involved, but as this involvement was just at the dividing point, the origin of the tumor was probably in the trachea.

Although primary tracheal sarcoma is rarer than carcinoma, we have been able to collect eighteen cases from the literature.

They have been reported by Schroetter,[115 116] O. Chiari,[118]

Levi,[119] Prota,[120] Heyninx,[121] Killian,[122] Gleitsmann,[123] Schroetter,[124] Labus,[125] Johnston-Cottrill,[126] Bamberger-Billroth,[127] Schech,[129] Pieniazek,[128] Wright,[130] Jurasz,[131] and Mayer-Hueni.[132]

In seven cases endotracheal operations were performed.

Of these one of Schroetter's cases[116] lived twenty years, with many recurrences. Gleitsmann's case, which I will describe more fully later on, lived nearly two years, with a recurrence in about fifteen months.

In Heyninx's case,[121] in which a myxosarcoma was removed from the trachea of a woman aged 41 years, with the hot loop, I could find no record of the final result.

In three cases no recurrence could be detected after a short period. Cases of Labus,[125] Johnston-Cottrill,[126] and Schech.[129]

Of the cases operated on by tracheofissure, the final result is only known in a few. In Mayer-Hueni's[132] and Wright's[130] cases no recurrence took place for a considerable period. In Jurasz's[131] case a slowly growing recurrence was noticed after two years.

Prota[120] has reported two cases, both in women between 40 and 50, in whom the growth was situated high up in the trachea.

Gleitsmann[123] has reported one of the few cases of tracheal sarcoma operated upon endotracheally.

The tumor in his case, that of a man aged 52 years, was situated in the upper part of the trachea and nearly filled its lumen. It was as large as a small walnut. The tumor was removed endotracheally with the Schech cannula, iridoplatinum wire, devised by Dr. Gleitsmann in 1894, being used. The growth was brought through the glottis without difficulty.

There was no recurrence for about fifteen months. The further history of the case, which Dr. Gleitsmann kindly sent me, is as follows: In March, 1903 (the first operation was performed in December, 1901), a small tumor reappeared below the anterior commissure and was removed with the snare as before. During the following months (April, 1903), the ventricular band became infiltrated, pain, fever, and aphonia developed, and at the last examination, May 9, 1903, the left half of the larynx did not move freely, and in the trachea small nodules could be seen below the anterior commissure and below the left vocal cord. A radical operation which was recommended was declined, and the patient was not seen again by Dr. Gleitsmann. He died some time in 1903.

This case teaches a valuable lesson. It proves the fact that endotracheal operations for malignant neoplasms offer very little chance of success. I have not been able to find records of any cases in which a patient remained permanently cured after an endotracheal operation. In the three cases before mentioned those of Labus, Schech, and Johnston-Cottrill, the statement was made that a cure was obtained after a "short period."

Both sexes seem to be equally afflicted with tracheal sarcoma, and young people rather more frequently than persons more advanced in years.

As a rule tracheal sarcomata are attached to the tracheal wall by a broad base and have a smooth surface. Occasionally they are pedunculated. They often reach a considerable size and almost completely fill the tracheal lumen.

For the sake of completeness, I will give brief abstracts of two other tracheal tumors, reported by Johanni[184] and Henrici.[185]

The tumor in Johanni's case filled the lower part of the larynx and upper part of the trachea in a woman aged 66 years, and finally caused her death. An exact histological examination is given. It was called an amyloid tumor.

In Henrici's case a tumor was present in the trachea of a man aged 61 years, who had suffered from "asthma" for fifteen or twenty years. It was situated on the posterior wall at the level of the third ring. A tracheofissure was made, and the tumor, which was 2½ cm. long and covered with a smooth intact mucous membrane, removed. Patient died suddenly two months after the operation.

The classification of the tumor could not be determined by the microscopical examination.

A review of the recorded cases of intratracheal tumors brings out some interesting points.

Of the benign growths papillomata occur most frequently, and of the malignant carcinomata are most frequently observed.

The following table shows the order of frequency with the number of each variety of tumor collected by the writer. This number could undoubtedly be added to materially, but it comprises most of the authentic cases on record to date:

Benign.—Papillomata, 25 cases; fibromata (fibrous polypi), 24 cases; ecchondromata and chrondro-osteomata, 17 cases; intra-

tracheal strumas, 10 cases; adenomata, 7 cases; lipomata, 3 cases; lymphomata, 2 cases; amyloid tumor, 1 case.

Malignant.—Carcinomata, 28 cases; sarcomata, 18 cases, making in all 135 cases, 89 of which are benign and 46 malignant.

A study of the cases shows also that tracheal tumors are situated in the majority of the cases in the upper part of the trachea and less frequently in the lower part. They most rarely occur in the middle of the trachea. They are attached most frequently to the posterior wall, which is rich in mucous glands. This is particularly true of the carcinomata, which appear to take their origin from these mucous glands.

Some other interesting facts are brought out by a consideration of the reported cases of tracheal tumors.

In the first place their great rarity. The 135 cases collected by the writer represent nearly all the authentic cases recorded during the past 75 years. The majority of the cases have been reported, of course, since the first one was observed with the laryngoscope in 1861.

The rarity of tracheal tumors becomes much more striking when the 89 benign and 46 malignant tracheal tumors are compared to the 10,747 benign and 1,550 malignant laryngeal tumors which Semon collected between 1862 and 1888.

The malignant tumors of the larynx represent only about 11 per cent. of the total number, while in the trachea, according to the cases collected by the writer, they represent about 50 per cent. of the total number. These figures are significant, because they show that a strong suspicion of malignancy must always attach to a tracheal tumor.

Etiology.—Very little is known in regard to the etiology of most tracheal tumors, and writers as a rule barely mention it. In considering the etiology of tracheal new growths etiological factors such as congenital displacement of tissue, predisposition, and a general specific diathesis of the system are of importance.

The fact that the trachea is not more often the seat of new growths may be explained by its protected position and its somewhat passive functions. It is not easily subjected to mechanical or chemical irritation.

Granulation tumors originating after tracheotomies were not considered in the writer's paper, because they are not true new growths. A chronic inflammation of the tracheal mucous mem-

brane probably plays an important role in the development of neoplasms. An inflammatory process, in conjunction with pulmonary tuberculosis, seems to have an important etiological bearing on the development of cartilaginous and bony formations. There is no apparent reason for this, however.

The ètiology of intratracheal struma, which has been well worked out, has already been considered in this paper.

Symptoms.—As the main symptoms of all tracheal new growths are those produced by the resulting stenosis, and as we are to have an exhaustive paper on this subject I will not mention symptoms directly caused by stenosis at all.

There are a few symptoms, however, which can be attributed to the tumors themselves. Tumors in the trachea may be present for years without causing any special symptoms, and it is surprising that even large ones sometimes cause so little disturbance.

A case has been reported by Siegert[22] in which a papilloma as large as a pigeon egg was situated at the tracheal bifurcation and did not cause any particular difficulty in breathing. This patient, a man 54 years old, died of general septicemia following an infection of a wound, and the tumor in the trachea was found at autopsy.

In one of Schroetter's cases[115] the patient lived many years with a sarcoma that almost completely filled the tracheal lumen.

In some cases attacks of suffocation only come on periodically. This was so in a case reported by Fifield,[57] in which a fibroid polyp as large as a berry, covering the opening of the left bronchus, was found at autopsy.

The character of the dyspnea varies according to whether the growth is pedunculated and freely movable or not. A movable growth acts like a valve, so that at times there will be an inspiratory dyspnea and at other times an expiratory dyspnea.

Gerhardt claims that a bending forward of the head is a symptom that is always present in *tracheal* obstruction, while in *laryngeal* stenosis the head is bent backwards.

The voice as a rule is not affected, except when growths with long pedicles are situated high up in the trachea and are carried to the glottis by the air current. In such cases some hoarseness may be present without much dyspnea. Masini[62] and Jurasz[68] both observed cases of this kind.

The voice may be also affected by an involvement of the

recurrent laryngeal in cases of tracheal carcinoma. Such observation have been made by Hinterstoisser[112] and Oestreich.[107]

Secondary symptoms are also produced particularly by slowly growing tumors. Occasionally diffuse bronchiectasis, empyema, and atelectasis are produced in certain portions of the lungs. Catarrhal bronchitis, lobar and lobular pneumonia, are also sometimes complications.

Koerner[109] has reported a case in which a carcinoma in the lower part of the trachea encroached upon the right bronchus, and produced an obstructive atelectasis of the whole right lung.

Diagnosis.—When the characteristic symptoms are present it is usually quite easy to make a diagnosis of some tracheal obstruction, although without direct inspection it would be hard to determine whether the obstruction is caused by a tumor, a stricture, or a foreign body. The diagnosis of a tracheal stenosis, the common symptom of intratracheal growths, is of course simple. It must be determined, however, whether the cause is in the trachea itself or from external pressure.

An examination of the upper part of the trachea, except in young children, can usually be made with the ordinary laryngeal mirror, after cocainization; in some cases without it.

Laryngoscopy can, however, be quite easily practised even in young children if they are given a little chloroform or somnoforme. A forehead lamp, or a self-illuminating mirror, is most convenient.

For laryngoscopy under an anesthetic a loop of silkworm gut may be passed through the tongue, as recommended by Jackson (*Laryngoscope,* April, 1905), and will not cause as much soreness as a tongue forceps. The Kirstein spatula is also of service for diagnosing tumors in the upper part of the trachea, and in children can be used just as well under general anesthesia. A good inspection of the trachea in adults may often be obtained, if the patient is examined while standing, according to Killian's method. In six of the seven cases of tracheal tumors operated upon by Bruns, he was able to make the diagnosis with the ordinary mirror. After cocainization much can be learned in regard to the nature of the growth with an extra long laryngeal probe. Instead of employing Kirstein's autoscope a Grant epiglottis lifter may be applied with the patient in Rosen's position and the upper part of the trachea inspected in this way.

An X-ray examination will at times show the presence of tumors that cannot be easily inspected and is a great aid in the diagnosis. For tumors below the middle of the trachea Killian's tracheoscopy or bronschoscopy would be of service if the tumor cannot be inspected in any other way.

As the methods of performing tracheoscopy, as well as the improvements of Ingals, Jackson, and others in instruments and methods of lighting the deeper parts of the trachea and bronchi, are so well known, I will not mention them here. Then we are to have a paper on tracheoscopy.

As an operation would have to be performed in any event, it is best to perform tracheotomy when symptoms become urgent, and make the diagnosis and perform the operation for the removal of the growth at the same time, rather than to subject the patient to a preliminary bronchoscopy or tracheoscopy. After tracheotomy an excellent inspection of the lower part of the trachea may be obtained through the ordinary Kelly cystoscope, after passing it down through the tracheal wound. An ordinary head mirror can be used in throwing light through the cystoscope. Small benign tumors could be removed through the cystoscope with forceps, particularly if a large cystoscope can be used.

The fibroma or fibrous polyp is usually pedunculated, and Schroetter[114] has reported a case of a distinctly pedunculated sarcoma which was freely movable.

In Proebsting's case[182] an apparent polyp with a long pedicle, which had been coughed out, was found to be carcinomatous. The intratracheal struma has been fully considered.

It is often difficult to make a differential diagnosis between carcinoma and sarcoma.

It was found in a study of the cases that carcinoma occurs more frequently, particularly in men of advanced years. When metastases, which are rare in primary tracheal carcinoma, occur in the lymphatic glands of the neck or in the larynx, esophagus, or bronchi, there is no doubt about the diagnosis.

Sarcoma usually occurs as a growth with a broad base and smooth surface. It grows slowly, sometimes becoming very extensive, however, and shows little tendency to ulceration.

Carcinoma shows a greater tendency to ulceration, and is usually more irregular in outline.

The tracheal papilloma can, as a rule, be recognized by its

appearance, particularly when it occurs in children, and is also present at the same time in the larynx.

Schroetter[118] has described a tracheal carcinoma occurring in the form of papillomatous excrescences. Wright[129] has also described sarcoma simulating papilloma.

Prognosis.—The prognosis of tracheal neoplasms, unless some operative measures are promptly carried out, may be said to be almost absolutely unfavorable, because without operation the stenosis caused by the tumor becomes greater all the time, and the patient may suddenly die of asphyxia even before a tracheotomy can be performed. The higher up in the trachea the tumor is situated, the more favorable the prognosis, because it can not only be more easily reached during operations, but, if tracheotomy becomes necessary, the cannula can be introduced below the tumor.

When tumors are present low down in the trachea near the bifurcation, a tracheotomy, without at the same time a removal of the growth, may not do much good, because it would be difficult to get the end of the cannula below the growth. The fibromata, particularly the pedunculated polypi, according to all authorities, give the most favorable prognosis, because they usually occur singly and do not show a tendency to recur when removed.

Lemoine[7] states that in 26 cases of benign tracheal growths collected by him cures were obtained by operations in 10 out of 14 patients. Of 12 not operated upon 10 died.

The prognosis of the intratracheal strumas is also favorable, as their growth is very slow and they apparently do not readily recur after removal. In the writer's case before mentioned, removed by tracheofissure, there has been no recurrence since the operation was performed in 1901.

The papillomata are not so favorable, because they are usually multiple, often recurring simultaneously in the larynx and trachea, and show a decided tendency to recur after removal.

Among the cases we collected the endotracheal removal was performed in 8, in all of which the growths were situated in the upper part of the trachea. There were recurrences in a number of these cases.

In four cases, all children, a laryngo-tracheofissure was performed in order to remove at the same time the laryngeal and

tracheal growths. A number of these cases subsequently died of recurrences. The carcinomata offer the most unfavorable prognosis of all. Statistics show that patients afflicted with tracheal carcinoma live as a rule only a few months, although they may live several years. Death usually results through slow suffocation, pneumonia, or metastases to neighboring organs.

On the other hand, observations are on record to show that at times the disease remains localized for a very long period. Tracheotomy does not seem to prolong life much in these cases, but if the cannula can be applied below the growth it certainly makes the patient's death easier. Schroetter[114] has reported a case in which it was not possible to get in the cannula at all.

From the fact that some cases of tracheal carcinoma develop so slowly and show no tendency to metastases, it does not seem too much to hope for that in the near future a radical operation such as a resection of the trachea will be performed more frequently and just as brilliant results obtained as in early laryngectomy for laryngeal cancer. I have been able to find only one case in the literature in which a resection of the trachea for carcinoma was performed. This case was reported by Bruns.[108] His patient lived six years after the operation. Koschier[101] has reported a case in which a carcinoma (cylindroma) was removed by tracheotomy, and six months after no trace of a recurrence could be detected. In tracheal sarcoma the prognosis does not appear to be extremely unfavorable. Data are lacking in regard to recurrences of tracheal sarcoma after removal. In fact practically nothing is known about it. In Gleitsmann's case of the endotracheal removal of a sarcoma there was no recurrence for about fifteen months, but soon after that the tumor did recur.

The growth of sarcoma in the trachea is very slow, the disease often extending over a period of years. Nor does the growth show any tendency to ulceration or extension to the surrounding structures.

Of the seven endotracheal operations on record for tracheal sarcoma, three cases were reported cured, although there is no record to show that they remained cured. These three cases were called cured because there was no recurrence in four or five months. In one case there was a recurrence, but the patient lived many years, and one case rapidly terminated fatally. Another patient (Gleitsmann's) lived nearly two years after the operation.

The growths in five cases were removed by tracheotomy, and in two there had been no recurrence after three months and one year. In one case there was a recurrence after two years. In two cases tracheotomy was followed by a fatal issue.

Treatment.—The treatment of the large majority of the cases of tracheal tumors may be summed up in the one word—operative. Palliative measures may be used when the growths are so small that they do not interfere to any extent with breathing, but it must be remembered that a good many of the tracheal new growths have a fairly rapid growth, so that it is safer to remove even small growths as soon as the diagnosis is made.

Tracheotomy performed for the purpose of relieving breathing comes under the head of palliative measures, and is successful if the cannula can be inserted below the growth.

As statistics show that in over one-half of all cases tracheal neoplasms are situated in the upper third of the trachea, a low tracheotomy would relieve the patient's breathing in a majority of the cases. In cases in which the tumor is situated very low down in the trachea, a piece of a rubber stomach tube may be used in case of emergency, if a long tracheal cannula will not reach below the growth. In such cases, if the patient's condition permits it, it would be wise to attempt the removal of the growth as soon as free respiration is established. Other conditions sometimes make tracheotomy difficult and even impossible.

The patient died in one of Schroetter's cases[114] while he was attempting to perform tracheotomy. The lumen of the trachea was so filled with the growth (carcinoma) that the cannula could not be inserted.

In inoperable cases a tracheotomy will have to be performed in any event, and in operable cases it not only prepares the way for a thorough inspection of the trachea, either with the finger or through a tube, but it is at times a necessary preliminary step to an endotracheal operation.

Endotracheal Operations.—Operations through the mouth should only be performed for small pedunculated benign growths, situated high up in the trachea. Endotracheal operations for malignant growths do not offer a much better chance of success than endolaryngeal operations for laryngeal cancer. They should not be attempted. Statistics in regard to the recurrence of tracheal sarcoma after endotracheal removal are sadly deficient.

The results of the seven endotracheal operations for sarcoma, as well as of those removed by tracheofissure, have already been given. The most favorable tumors for removal through the mouth are the papillomata, and about a dozen such operations have been performed—a majority of all endotracheal operations.

The technique is the same, except that longer instruments have to be used, as for laryngeal operations.

Children can be operated upon under general anesthesia with the aid of the Kirstein spatula.

The removal of a tracheal tumor by tracheotomy, or better tracheofissure, is the operation of choice for the majority of the cases. Benign neoplasms of all kinds can be readily and radically removed in this way, and there is much less chance for recurrence than when they are incompletely removed through the mouth. This is particularly true of the five cases of intratracheal struma (four of Bruns and the writer's case), in which there have been no recurrences after radical operations (tracheofissure). There are about twenty such operations for different tracheal growths on record.

Mayer-Hueni[182] removed in this way a sarcoma situated just above the bifurcation.

In performing these operations the anterior wall of the trachea should be split for a considerable distance, so as to give the operator plenty of room. Either a tampon-cannula can be used, or the operation can be performed in some cases of benign growth without it, with the patient in the Trendellenberg position.

Resection of the trachea has only been performed in one case, that of Bruns[104] before alluded to.

He removed a carcinoma of the posterior tracheal wall, including the posterior wall and ten of the rings, keeping the patient alive for six years.

After tracheotomy small tumors low down in the trachea may at times be removed through a cyctoscope under direct inspection.

BIBLIOGRAPHY.

GENERAL.

1. Koch, W. Geschwuelste d. Luftroehre. Archiv. f. klin. Chirurgie, Bd. xx, S. 540, 1876.

2. Roch, P. Sur. les tumeurs de la trachee. Ann. des Mal. de `reille, etc., xvi, p. 682, 1890.

3. Mueller H. Ueber Luftroehrengeschwuelste. Diss., Jena, 1865.
4. Orth, D. Die Neubildungen der Trachea. Diss., Heidelberg, March, 1892.
5. Schroetter. Vorlesungen u. d. Krankheiten der Luftroehre, 1896.
6. Scheuer. Ueber Trachealtumoren. Diss., Munich, 1893.
7. Lemoine. Etude sur les tumeurs de la trachee. These de Paris, 1899.
8. Bruns, P. von. Die Neubildungen in der Luftroehre. Heymann's Handbuch der Laryngologie und Rhinologie, L. 23, 1898.

BENIGN NEOPLASMS.

Papillomata.

9. Bruns. Die Laryngoskopie, S. 322, 1865.
10. Maissonneuve. Bull. de la Soc. Anatomique de Paris, xxxi, p. 143, 1856.
11. Davis-Colley. British Medical Journal, vol. 11, p. 354, 1872.
12. Schroetter. Wiener med. Blaetter, No. 43, 1880.
13. Mackenzie, M. British Med. Journal, May 30, 1874.
14. Mackenzie, M. Diseases of the Nose and Throat, vol. i.
15. Labus. Archiv. Ital. di Laringologia, No. 1, 1881.
16. Butlin. St. Bartholomew's Hosp. Rep., 1882, p. 129.
17. Labus. Monatschr. f. Ohrenheilkunde, p. 124, 1886.
18. J. Solis-Cohen. Ashhurst's International Encyclopedia of Surgery, vol. v, p. 340, 1888.
19. Schaller. Seltener Fall v. Kehlkopf u. Trachealpapillom. Diss., Munich, 1889.
20. Teschendorf. Fall von multipl. Papill. d. Larynx u. Trachea. Diss., Koenigsberg, 1893.
21. Chiari, O. Erfahrungen auf d. Gebiete d. Hals u. Nasenkrankh., S. 35, 1887.
22. Siegert. Virchow's Arch., Bd. cxxix, S. 413, 1892.
23. Weil. Monatschr. f. Ohrenheilkunde, No. 12, 1892.
24. Stoerk. Klinik d. Krankheiten d. Kehlkopfes, S. 438.
25. Stoerk. Ibid.
26. Mackenzie, M. Essay on growths in the larynx. London, 1871, p. 111.
27. Krishaber. Gaz. des hopit., No. 84, 1874.

Adenomata.

28. Scheuer. Diss., Munich, 1893.
29. Radestock. Beitraege z. path. Anat. (Ziegler), Bd. iii, S. 289, 1888.

30. Mayer, E. Ueber d. maligne Adenom d. Schildruese. Fraenkel's Archiv., Bd. v, S. 389, 1896.
31. Chiari, O. Praeger med. Wochenschr., No. 51, 1883.
32. Kolisko. Verg. Schroetter. Vorles. u. d. Krankh. d. Luftroehre, S. 149.
33. Paltauf. Beitr. zu path. Anat., Bd. xi.
34. Rosenheim. Tracheal tumor. Amer. Jour. Med. Sciences, June, 1904, and N. Y. Med. News, April 2, 1904.

Lipomata.

35. Chiari, O. Praeger med. Wochenschr., No. 51, 1883.
36. Rokitansky. Zeitschr. d. k. Gesellsch. d. Aerzte z. Wien, 1851, S. 177.

Lymphomata.

37. Clark. Med. Times and Gazette, Dec. 13, 1873, p. 679.
38. Vogler. Ueber d. primaer. Trachealtumoren. Diss., Zurich, 1896.

Ecchondromata and Chondro-osteomata.

39. Ganghofer. Zeitschr. f. Heilkunde, Bd. 1, S. 350, 1880.
40. Virchow. Die Geschwuelste, S. 442, 1863.
41. J. Solis-Cohen. Ashhurst's International Encyclopedia of Surgery, vol. v, p. 340.
42. Chiari, O. Wiener med. Zeitschr., No. 34, 1878.
43. Heymann, R. Virchow's Archiv., Bd. 116, S. 329.
44. Steudener. Ibid., Bd. xlii.
45. Hammer. Zeitschr. f. Heilkunde, Bd. x, S. 458, 1889.
46. Wilks. Trans. Path. Soc., London, vol. viii, p. 88, 1857.
47. Chiari, O. Wiener med. Zeitschr., 1882.
48. Schroetter. Vorlesungen u. d. Krankh. d. Trachea, S. 41.
49. Mischaikoff. Ueber Knochenbildungen in der Trachealschleimh. d. Menschen. Diss., Zurich, 1894.
50. Klebs. Handbuch d. path. Anat., Bd. ii, S. 299.

Fibromata (Polypi; fibrous polypi).

51. Rokitansky. Wiener med. Zietschr., vii, 1851.
52. Tuerck. Krankheiten d. Kehlkopfes, S. 502, 1886.
53. Maissonneuve. Ber. in Gerhardt's Handbuch f. Kinderkrankh., iii, S. 269.
54. Stallard. Klebs; Handbuch d. path. Anat., Bd. ii, S. 296.
55. Eppinger. Ibid.
56. Mackenzie, M. Disease of the Nose and Throat, vol. i, p. 504, 1880.
57. Fifield. Boston Medical and Surgical Journal, Nov. 14, 1861.

58. Mackenzie, M. Ber. in Monatschr. f. Ohrenheilk., S. 26, 1885.
59. Crutchley-Mackenzie. Lancet, Nov. 8, 1884.
60. Ingals, E. F. Annales des Malad. de l'Oreille, etc., 1884, p. 365.
61. Lewin. Berliner klin. Wochenschr., S. 64, 1886.
62. Masini. Rev. mens. de laryng., 1887, No. 3.
63. Braun. Wiener med. Blaetter, No. 30, S. 468, 1889.
64. Avellis. Monatschr. f. Ohrenheilk., No. 7, 1892.
65. Mackenzie-Johnston. Edinb. Med. Journal, vol. 30, June, 1886.
66. Oazmann. Ber. in Monatschr. f. Ohrenheilk., S. 226, 1888.
67. Bidwell. British Med. Journal, Nov. 8, 1890.
68. Jurasz. Versamml. Sueddeutsche Laryng., 1896.
69. Bockenheimer. Verg. M. Schmidt. Krankheiten d. oberen Luftwege, S. 602, 1897.
70. Fournie. Gaz. des Hop., No. 56, 1868.

Intratracheal Struma.

71. Neumayer, H. Intratracheale Strumen. Monatschr. f. Ohrenheilk., No. 9, 1904. (Diagnosis not proved.)
72. Frankenberger. Struma intratrachealis. Monatschr. f. Ohrenheilk., No. 12, 1904. (Diagnosis not proved.)
73. Ziemssen. Handbuch der speciellen Pathologie und Therapie, Bd. iv, 1875.
74. Bruns, P. Die Laryngotomie z. entfernung endolaryngealen Neubildungen, S. 201; und Heise, Beitraege z. klin. Chirurgie, Bd. iii, S. 109 to 132, 1888.
75. Heise. Ueber Schildruesentumoren im inneren d. Kehlkopfes u. d. Luftroehre. Beitraege z. klin. Chir., Bd. iii, S. 109, 1888.
76. Heise. Ibid.
77. Roth. Verg. P. Bruns. Zur Frage der Entkropfungskachexie. Beitraege z. klin. Chir., Bd. iii, S. 329, 1888.
78. Paltauf, R. Schildruesentumoren im inneren d. Kehlkopfes u. d. Luftroehre. Beitraege zur path. Anat. u. z. allgem. Path., Bd. xi, S. 71 to 90.
79. Bruns, P. Handbuch d. Laryngol. u. Rhinol. (Heymann), S. 966, 1898.
80. Baurowics. Ueber Schildruesengeschwuelste im inneren d. Kehlkopfes, etc. Archiv. f. Laryngol. u. Rhinol., Bd. viii, S. 362, 1898.
81. Freer, O. T. Thyroid tissue in the larynx and trachea. Journal of the American Medical Association, p. 876, March 30, 1901.
82. Theisen, C. F. A case of intratracheal colloid struma;

operation; recovery. American Journal of the Medical Sciences, June, 1902.

83. Gruber, W. Ueber die glandula thyroidea accessoria. Archiv. f. path. Anat., Bd. lxvi, S. 447, 1876.

84. Gley. Glandes et Glandules thyroides du chien. Societe de Biologie, Feb. 25, 1893.

85. Kolisko. Verg. Schroetter. Vorlesungen u. d. Krankheiten d. Luftroehre, S. 149, 1896.

86. Orth. Bd. i, S. 586.

87. Streckeisen. Beitraege z. Morphologie d. Schilddruese. Virchow's Archiv., Bd. ciii.

88. Radestock, V. Beitraege z. path. Anat. (Ziegler), vol. iii, S. 289, 1888.

MALIGNANT NEOPLASMS.

Carcinomata.

89. Delafield. New York Medical Journal, p. 406, 1882.

90. Langhans. Virchow's Archiv., Bd. 53, S. 540, 1871.

91. Mackenzie, M. Diseases of the Nose and Throat, vol. i, p. 508, 1880.

92. Schroetter. Laryngologische Mittheilungen, 1875, S. 86.

93. Gibb. Quoted by Orth.

94. Gerhardt. Deutsche med. Wochenschr., S. 1024, 1887.

95. Klebs. Virchow's Archiv., Bd. 38, S. 212, 1867.

96. Schroetter. Laryngol. Mittheil., S. 86, 1870.

97. Schroetter. Jahresber. d. Klin. f. Laryngoskopie, 1873, S. 103.

98. Reiche. Deutsche med. Wochenschr., S. 219, 1892.

99. Fischer. Monatschr. f. Ohrenheilk., No. 12, 1882.

100. Oestreich, D. Primaeres Carcinom d. Trachea. Deutsche med. Wochenschr., No. 9, 1895.

101. Ehlich. Monatschr. f. Ohrenheilk, No. 3, 1896.

102. Koschier, H. Wiener klin. Wochenschr., No. 24, 1896.

103. Koschier, H. Ein Beitrag z. Kenntniss d. Trachealtumoren. Wiener med. Wochenschr., No. 35, 1898.

104. Bruns, P. Resection der Trachea bei primaeren Trachealkrebs. Beitr. z. klin. Chirurgie, xxi, 1898, S. 284.

105. Boschi, E. Scieta Medicochirurgica di Bologna, Dec. 22, 1899.

106. Hoffman, R. Ein Fall von isolirten primaeren Carcinom d. Trachea. Monatschr. f. Ohrenheilk., No. 8, 1905.

107. Oestreich, D. Zeitschr. f. klin. Med., Bd. 28.

108. Sabourin. Annal. des Mal. de l'Oreille, etc., p. 11, 1879.

109. Koerner. Muench. med. Wochenschr., No. 11, 1888.

110. Pogrebinsky. Rev. mens. de laryngol., No. 12, 1894.

111. Pick. Wien. klin. Wochenschr., No. 4, 1891.

112. Hinterstoisser. Ibid., No. 19, 1889.

113. Schmidt, Moritz. Op. cit., S. 641.
114. Schroetter. Vorlesungen u. d. Krankh. d. Luftroehre, S. 178.

Sarcomata.

115. Schroetter. Jahresber. d. Klinik f. Laryngoskopie, S. 80, 1871.
116. Schroetter. Laryngol. Mittheilungen, S. 102, 1875.
117. Bergeat, H. Das Sarcom d. Kehlkopfes u. d. Luftroehre. Monatschr. f. Ohrenheilk., Nos. 8, 9, 10, 11, 1895.
118. Chiari, O. Wiener klin. Wochenschr., No. 52, 1896.
119. Levi, C. Tumeur sarcomateuse de la trachee. Societe anatomique de Paris, April, 1897.
120. Prota, G. Sarcoma primario della trachea. Archiv. Ital. di Laringologia, April, 1899.
121. Heyminx. Ber. d. Bel. oto-rhin. laryngol. Gesellsch., June 17 and 18, 1905.
122. Killian, Gustav. Ein Trachealsarcom. Archiv. f. Laryngol. u. Rhinol., Bd. xii, iii, S. 423, 1902.
123. Gleitsmann, J. W. Subglottic sarcoma removed endolaryngeally, etc. Trans. Amer. Laryngol. Assn., 1902.
124. Schroetter. Wiener med. Jahrb., 1868.
125. Labus. Gaz. d. Osped., No. 22, 1880.
126. Johnston-Cottrill. Edinburgh Med. Journal, June, 1886.
127. Bamberger-Billroth. Centralbl. f. Laryngologie, Bd. iv, S. 456.
128. Pieniazek. Arch. f. Laryngol., Bd. iv, S. 226.
129. Schech. Krankheiten d. Kehlkopfes u. d. Luftroehre, 1897.
130. Wright. Journal of the Amer. Med. Assn., Sept. 26, 1891.
131. Jurasz. Krankheiten der oberen Luftwege, 1892.
132. Meyer-Hueni. Correspondenzbl. f. Schweizer-aerzte, 1881.
113. Proebsting. Versamml. Sueddeutsche Laryngol., 1896 (carcinoma).

Amyloid Tumor.

134. Johanni, J. W. Fraenkel's Archiv. f. Laryngol., etc., Bd. 14, H. 2, S. 331.

Unclassified.

135. Henrici. Ein Beitrag zur Kenntniss der Trachealtumoren. Archiv. f. Laryngol. u. Rhinol., Bd. xvii, H. 11, S. 283, 1905.

Third Paper.

STENOSES OF THE TRACHEA.

BY WILLIAM KELLY SIMPSON, M.D.

IN speaking on that portion of the subject allotted me, namely, "The Stenoses of the Trachea," and to keep well within sequence with the other papers forming this discussion, one is confronted with two very important considerations: First, whether the morbid processes causing the stenoses originate within and confine themselves to the trachea itself—that is, not an extension from the larynx above or the bronchi below; and, secondly, whether the stenosis is due to conditions arising within the trachea or to compression of the trachea from without.

Stenosis arising within the larynx and continuing to the subglottic portion and the trachea below was well and thoroughly considered in detail at the 1905 meeting of this Association by Dr. John Rodgers, and need not be considered here.[1] So my remarks will pertain more especially to stenoses confined to the trachea itself, realizing, however, the difficulty of such an absolute limitation.

Causes.—For the purpose of a more thorough discussion, the causes of tracheal stenosis may be divided into extrinsic and intrinsic, the extrinsic variety including that form known as compression of the trachea; and it sometimes follows in this relation that causes which originate without may, by extension of the lesion, incorporate the tracheal lumen and thus develop an additional or true tracheal stenosis. This is probably seen to happen more in malignant disease than in other forms of external causes, and, further, various external causes, such as aneurisms, abscesses, and suppurating glands, may—after a period of pressure—rupture and discharge their contents into the trachea, causing often a fatal termination.

Among the extrinsic causes may be mentioned:

1. Struma, which according to Chiari is the most common of external causes.[2]

2. Pressure by various tumors, whether benign or malignant.

3. Glandular hypertrophies, including tubercular and the various phases of goitre. Thymus hypertrophy, which in the opinion of Riegel and others,[3] though it may (though rarely) cause compression stenosis, shows the effects of compression mainly on the vascular and nervous trunks.

4. Pressure by emphysema, either traumatic or extending from pulmonary disease below.

5. Aneurisms, either from the aorta below or from the lateral cervical vessels.

6. Diffuse or localized phlegmonous cellular inflammations of of the neck with or without the production of abscess.

7. Extension of bone disease from sternum, clavicle, and vertebral column.[4]

8. Traumatisms, including fractures, ruptures, cutthroat, strangulation, etc.

Mediastinal diseases, though giving rise to pressure on the primitive bronchi, are not regarded by Riegel[5] as frequent causes of tracheal pressure; if so, the compression is not very great.

Chiari[6] mentions an occasional cause called struma ventosa, i.e., accumulation of air in the region of the upper portion of the thorax after injuries of the large air passages.

The character, intensity, and difficulty of determining the various external causes depend on the location of the compression factor—those from deep within the tissues of the neck, those posteriorly situated, and those arising from below being the most difficult in point of determination and relief; while those more external in their nature and laterally situated offer the most easy solution from all points of view.

Frequently from long continued lateral pressure the trachea may be deflected from its median position in part or in the whole of its entire length, which fact must be borne in mind, as it often adds greatly to the difficulty in operative procedures for relief.

Intrinsic causes may be conveniently classed as being due to:

1. Cicatrices and adhesions.

2. Morbid growths and foreign bodies.

3. Inhalation of smoke, flame, volatile fumes, ingestion of corrosive chemicals and acids.

4. Inflammations, thickening of tracheal walls.

According to Chiari,[7] intratracheal stenosis is much more rare

than that from external causes, but when it does exist it involves a greater extent of tracheal lumen. The form and severity depend essentially on the causative factor, no two cases seeming to be alike in detail of stricture formation, which makes it a most interesting study in reviewing the many reports of isolated cases and which bears greatly on individual ingenuity in the way of treatment.

Under the first heading, tertiary syphilis and secondary stricture from tracheotomy are undoubtedly the most common causes, the cicatrization and contraction of the syphilitic ulcer following the same law in destructive deformity as seen so commonly in the larynx and pharynx above. Though generally irregular in shape, certain cases show a distinct annular formation with a comparatively uniform stenotic apperture.

Although ulcerations from glanders, diphtheria, typhoid fever, tuberculosis, and even so-called catarrhal ulcerations, have been reported as producing tracheal strictures, the instances are but exceptional and rare. In this relation I may mention the extensive and interesting account by Schroetter,[8] with detail of treatment and illustrations, of a case of primary tracheal tuberculosis producing stricture. He goes deeply into the subject and offers many conclusions worth reading.

The irritation from long-continued wearing of a tracheal cannula, from whatever cause it may have been originally introduced, frequently produces a secondary stricture along the various points of contact, and this liability must always be given thought when tracheotomy is performed, and every effort made to dispense with the cannula as soon as possible, especially if originally introduced as a temporary procedure; and a choice of size and shape of cannula should be made which will have the least tendency to these after pressure effects. Though occurring at either extremity of the cannula, the most frequent location of secondary stricture is at the upper end, about and above the orifice of the tracheal opening, where granulations may form which subsequently may become very dense and on attempt at removal of cannula may fall down in the trachea, thus necessitating the constant reintroduction of the tracheal tube to prevent suffocation. The granulations may take on the character of the original cause for which the tracheotomy was performed, especially if for malignancy or papilloma; or there may be formed hard, firm, contracting granulation

tissue, due to pure pressure effect and independent of any diseased condition. This contraction becomes very marked in some instances, completely shutting off any connection with the larynx above. This condition offers one of the most difficult factors in attempts at restoration of the tracheal lumen by dilatation.

Tracheotomy may also produce an inverting of the tracheal rings, necrosis of the rings, and also tracheal defects from pressure absorption with subsequent stricture at these points. The tendency of these aftereffects depends greatly on the diseased conditions of the mucous membrane producing the original cause of the stenosis.

Strictures from intratracheal growths and foreign bodies will be duly considered under the portion of the discussion allotted to those subjects, and need no mention here.

Strictures resulting from inhalation of smoke or flame, scalds, volatile fumes, the ingestion of corrosive chemicals and acids sometimes occur, and in some instances the resultant damage may be more or less limited to the trachea, but as a rule there is a general involvement of the contiguous passages. These accidents are naturally of a severe type and are apt to prove fatal in the initial inflammation.

Strictures from primary or inflammatory thickening or hypertrophy of the tracheal walls, may arise from ulcerations, edema, acute or chronic inflammatory swellings, perichondritis, abscesses, or scleroma.

Symptoms.—Although cough, change in character of voice, sense of irritation or uncomfortable suffocative sensations about the throat may lead to suspicion of tracheal implication, the chief symptom is interference with breathing, which, when excessive become stridulous in character, the stridor indicating mechanical obstruction of larynx or trachea. The voice is not very characteristic. It may be faint or of a muffled character, though perhaps with some effort in phonation, but generally remains clear, following the law of subglottic stenosis as compared with the various types of hoarseness indicating laryngeal involvement.

Tracheal dyspnea has some characteristics peculiar to itself. It is inspiratory in character, the inspiration being longer than expiration. It may be of a noisy, labored, wheezing nature, becoming at times audible at a considerable distance, but it has not the

peculiar brassy, croupy, stridulous sound of laryngeal dyspnea. The wheezing sound may sometimes be felt as a thrill.

In tracheal stenosis the larynx remains almost stationary in action, being quite in contrast to laryngeal stricture, where the larynx makes profound excursions up and down in efforts at breathing. This phenomenon was first pointed out and emphasized by Gerhardt.[9]

During the preparation of this discussion the writer has had the opportunity of observing this phenomenon as it concerns the larynx, to a marked degree, in the case of a patient with a bilateral abductor paralysis, who in all efforts to breathe would cause the larynx to make most prolonged and violent excursions. Whether the character of the laryngeal obstruction causes any accentuation in this phenomenon, I am unable to say. Gerhardt also pointed out the fact that in tracheal stenosis the head is either kept in the upright position or bent forward; while in laryngeal dyspnea the head is thrown back. My observations have been that the tendency to the forward bending of the head becomes more prominent the lower the stenosis in the trachea, reaching its fullest bending in bronchial stenosis or spasm, as seen in the position of the asthmatic patient.

Auscultation of the chest is only of importance as distinguishing tracheal stenosis from unilateral bronchial stenosis, in that, in the latter instance, the vesicular murmur is absent or diminished on the side affected; but if there be bilateral absence of murmur the stenosis may be either in the trachea or located at the bifurcation.

Demme[10] alludes to the fact that in long-standing tracheal stenosis the circumference of the upper portion of the thorax is diminished in measurement.

While the above phenomena include the salient features of tracheal stenotic symptoms, there may be other isolated special symptoms, as, for instance, the frequency of changes in pulse rate and distention of cervical veins, depending on the degree of external pressure and the implication of the pneumogastric nerve. Paroxysmal attacks of suffocation may supervene, but they are not so constant a factor as in laryngeal stenosis. Aufrecht[11] reports a new symptom of tracheal stenosis. In three cases of stenosis of the trachea the author was able to observe a symptom which had not been as yet described in this connection. When the

stethoscope was applied to the trachea, immediately above the sternum, the very rough bronchial breathing, which in the normal condition is invariably perceptible during the entire time of inspiration and expiration, was found to be replaced by a short, low, soft breathing, or was entirely inaudible. We are greatly indebted to Gerhardt[12] for the most complete exposition of tracheal stenosis, and I quote from him in his attempt to formulate its stages, of which he recognizes three.

"1. Almost entirely free from disturbances, labored respiration coming on only upon physical exertion.

"2. A stage of continuous and well-marked stenosis which may extend over a great length of time, and which presents almost all the symptoms occuring in stenosis of the larynx, especially the audible respiration sounds, the form of respiration, and its relative prolongation. The voice of the patient is weak in this stage and of limited volume.

"3. Is apt to appear very rapidly. It commences with a paroxysm of suffocation which soon passes over and from which the patient apparently recovers. Nevertheless the paroxysm recurs after a shorter or longer interval, and the patient either dies in this paroxysm or succumbs to a rapidly extending pneumonia of aspiration."

Riegel very truly comments that although every case of tracheal stenosis by no means passes through these three stages in the order given, still this may be regarded as the normal course in the majority of cases.

Diagnosis.—Though the symptoms above enumerated direct our attention at once to the trachea, it is fortunate that we are not entirely dependent upon these subjective symptoms in order to substantiate our diagnosis, for we have at our command facilities for examination which, in practically all cases, make the diagnosis a matter of certainty. It goes without saying that any decided external manifestation of pressure will at once account for the stenotic symptoms. When these manifestations are not present, we have the use of the laryngeal mirror, which in nearly all instances will bring the entire tract under view and will at once give us the extent of laryngeal involvement in its association with the trachea.

The X-ray is most invaluable, especially as to accurately locating dense tumors and foreign bodies, and bronchoscopy, as at

present perfected, leaves little to remain in the way of perfecting our information. One thing must always be remembered, and undoubtedly has been the experience of us all—that in depending upon the laryngeal mirror we have always found on operation a greater extent of stenosis than the picture of the laryngoscope seemed to indicate. This is especially so in malignant cases.

Treatment.—Perhaps in no other condition can we better employ the broad saying that the first element of treatment depends on the recognition of the cause. Especially is this so as it pertains to the external compression type of cases, where the proper surgical treatment, serum, or glandular therapy at once suggest themselves. This same axiom applies to the removal of intratracheal growths and foreign bodies; and if syphilis be the cause, the administration of kalium iodide and mercury.

But in a certain number of cases, those of pure internal strictures, treatment must be directed to the relief or eradication of the stricture itself. For this purpose we have at command tracheotomy; tracheal fissure, with exsection of the stricture tissue; resection of that portion of the trachea which includes the stricture; and, finally, the various forms of dilatation.

Tracheotomy as a sole measure should only be resorted to when it is conclusive that no other surgical means can be employed. It must however be used in a large proportion of cases as a life-saving measure in cases of emergency, and as a preliminary measure to dilatation when the stricture cannot be reached through the larynx, and under these circumstances should be made as high up as the nature of the stricture will allow.

It sometimes occurs that the extent and deep location of the stricture is only determined after tracheotomy has been performed for the relief of the dyspnea and we find that the operation has been unsuccessful. In these cases it becomes necessary to supplement the tracheotomy by the passing down of long flexible catheters through the tracheotomy tube in order to produce the desired relief. These cases are in their nature very extreme in type and subsequently prove fatal. I have seen such instances, one[18] a case of deep aneurism pressing on the trachea at the bifurcation; and another, unpublished, due to a chain of deep cancerous glands, alternately pressing on the trachea, in which the urgent dyspnea was almost the first indication of their presence.

Resection of the stricture tissue itself may sometimes be possi-

ble in suitably situated or limited cases, either through fissure of the trachea or by means of the bronchoscope, subsequent dilatation being necessary for permanent cure.

Resection of the trachea itself is advocated by O. Frankenberger[14] as the only radical treatment for all strumous stenoses and all chronic stenoses, which include but a limited portion of the trachea, and reports two successful cases as done by Kuestner.

It is the general consensus of opinion that the best treatment of internal tracheal stricture is by some form of dilatation, and I think we can say without contradiction that the best method is that based on the principles of O'Dwyer's form of intubation. If the stricture be very high up in the trachea it may be possible to produce dilatation through the larynx by intubation without tracheotomy, but in the vast majority of cases of tracheal stricture it becomes necessary to do a preliminary tracheotomy in order to carry out subsequent dilatation. If it be elected to use intubation after tracheotomy, the tracheotomy should be performed as high up as possible, so that the end of the intubation tube can pass below the tracheotomy opening as far as possible in order to be better retained. If we find that the intubation tube cannot be well retained, then the retention device of Dr. John Rodgers, reported by the writer, may be used.[15]

Intubation either with or without tracheotomy is better indicated for long and retained periods of dilatation. The present types of hard rubber tubes will meet all requirements and are, I think, generally speaking, better than metal. It may be necessary to do some form of preliminary stretching of the stricture before the full value of intubation can be obtained. I think we should always endeavor, as far as possible, to employ the permanent method of intubation where it can be accomplished. In a certain number of cases intubation by O'Dwyer's method may be impracticable. In those instances we have the well known methods of Schroetter, and the glass chimney cannulas, as first introduced by Mikulicz, the details of which are fully described by Kuemmell.[16] Soft rubber chimney cannulas, to meet certain conditions, are also described.

Schmieden, in a recent detailed and illustrated article,[17] refers to the use of Dupuis' chimney cannula, Schroetter's wedges, Thost's wedge cannulas, and a chimney cannula proposed by Schimmelbusch and successfully used in Bergmann's clinics; also to a

cannula in the shape of an L. These various forms are intended to meet various peculiarities of strictures which may arise. Schmieden emphasizes the necessity of the early use of these

Mikulicz glass chimney cannula for tracheal stenosis.

dilating measures in order to avoid the more extensive future operation of exsection, etc.

References.

1 Trans. Am. Laryng. Assn., 1905. Dr. John Rodgers.
2. O. Chiari. Die Krankheiten der oberen Luftwege.
3. Ziemssen. Vol. iv, p. 478.
4. Demme-Ziemssen. Vol. iv, p. 478.
5. Ziemssen. Vol. iv, p. 478.
6. Loc. cit.
7. Loc cit.
8. H. von Schroetter. Deutsche med. Woch., July 11, 1901.
9. Ueber syph. Erkrank. Deutsches Archiv. f. klin. Med., Bd. ii, p. 535. Also Lehrbuch der Auscultation und Percussion. Zweiter vermehrte aus Verbesserte Auflag. Tubingen, 1871, p. 219.
10. Ueber Stenose der Trachen. Wuerzburg. med. Zeitschrift, Bd. ii.
11. Centralblatt fuer innere Med., No. 1, 1897.
12. Loc cit.
13. Recurring dyspnea after tracheotomy, Dr. John Rogers. N. Y. Med. Rec., April 7, 1900. Vol. 59.
14. Ann. des Mal. de l'Oreille, May, 1901.
15. Trans. Am. Laryng. Assn., 1901.
16. Arch. fuer Laryng. und Rhinol., vol. iv, 1896.
17. Muenchener med. Woch., Jan. 9, 1906.

Additional Bibliography.

In addition to the references already mentioned the reader is referred to the following:

Keen and Jones. Phil. Med. Jour., June 10, 1889. Two cases of tracheal obstruction.

Downie. Brit. Med. Journal., October, 1889. Three cases of syphilitic ulceration.

Sabrazes and Cabannes. Rev. Hebdom de Laryngol., Nov. 1898. Case of Tracheocele.

K. Huhn. Centralb. f. Chirurgie, No. lv, 1902. Treatment of tracheal stenosis, with a special consideration of retrograde intubation.

Killian. Arch. fuer Laryngol. und Rhinol., vol. xii. A case of fatal sarcoma with stricture.

Loehrer. Muench. med. Woch., No. xxvii, 1904. A case of complete obstruction of the trachea by caseous and resolving bronchial lymph nodules after perforation into the right bronchus.

Schmieden. Medizinische Klinik, No. 34, 1905. Treatment of tracheal stenosis.

Laurens. Chirurgie Oto-Rhino-Laryngologique, 1906. Strictures of larynx and trachea, with special reference to treatment.

Niehaus. Centralb. fuer Chir., No. 31, 1903. Treatment of laryngeal stenosis and tracheal defects.

Kander. Von Bruns' Beitraege, vol. 38, Heft I, 1903. Resection and suture of the trachea in tracheal stenosis and diaphagmatic stenosis of the larynx.

Von Haeker. Beitr. z. klin. Chirugie, vol. 44. The treatment of scar stricture of the trachea and Mangoldt's laryngo-tracheoplastics.

Tschudy. Arch. fuer klin. Chir., vol. 64, 1901. The treatment of acute tracheal stenosis by tracheal intubation.

Morgan. Chicago Med. Record, June, 1901. Goitre complicated by stenosis of the trachea.

H. A. Capy. N. Y. Med. Jour., Jan. 26, 1901. Skin transplantation for severe stenosis of the larynx and trachea.

O. Frankenberger. Wiener klin. Rundschau, 1900. No. 16. Zur Casuistik der Tracheoalstenosen. (This article is very replete in reference to the literature of the subject of tracheal stenosis.)

Novotny. Arch. fuer Laryngol. und Rhinol., vol. xvii, Heft 2. Tracheal and bronchial stenosis.

Fourth Paper.

FOREIGN BODIES IN THE TRACHEA AND TRACHEOSCOPY.

BY A. COOLIDGE, JR., M.D.

THE proper treatment of a case in which a foreign body has been inhaled into the trachea has been discussed periodically in medical literature for a century. A very large number of cases have been reported, the foreign bodies including an enormous variety of objects. The symptoms offer almost as much variety, from instant death to practically no symptoms at all. The diagnosis of a foreign body in the trachea or bronchus is not always easy. The history may be misleading. If it is in the trachea it seldom remains long in one place. There is generally much respiratory irritation, cough, spasm of the glottis, sometimes a rattle as it moves up and down. It seldom stays long in the trachea; it is either expelled or drawn into a bronchus. If in a bronchus, there may or may not be dyspnea, cough, pain in different parts of the chest, either constant or periodic. The foreign body, unless it obstructs the passage of air, may produce little or no irritation, but ultimately will cause local infection and consequent symptoms. The diagnosis may be made positively by inspection with the bronchoscope, or if it is an inorganic substance by the X-ray, or it may be made probable by physical signs. The prognosis, if a foreign body has been inhaled, depends upon the nature of the body, the condition of the patient, and the possibility of proper treatment. The nature of the body will determine the distance that it can penetrate into the bronchial tubes, the amount of trauma or sepsis which it will cause and the ease with which it can be detected and removed. The condition of the patient may be seriously affected if air has been cut off from any part of the lungs, if much irritation be produced, or if there is serious sepsis. On the other hand, foreign bodies have not infrequently remained for months or even years in the air passages, and have finally been expelled or removed, but they

almost always cause or keep up more or less infection, which either slowly weakens the patient or by an exacerbation becomes fatal. When the foreign body is expelled or removed, the patient, unless in a very serious condition at the time, generally entirely recovers.

The important questions for the responsible physician, after considering the nature of the foreign body, its probable position, and the condition of the patient, must always be: First, what is the danger of leaving it alone and doing nothing? Second, is the patient's chance better or worse if an attempt is made to reach and remove it by operating? And third, what, if any, operation shall be done? While the answer to the last two questions has, I think, materially changed within the last few years, the answer to the first, what is the danger of leaving it? is the same as it has always been.

To briefly review this question I will quote from a monograph by Roe, in 1893. He found that the mortality in the cases which he collected was about 30 per cent. where no operation had been done. The writer justly says that statistics are misleading if we do not take into consideration the various conditions affecting them. A number of cases in which seeds or other small objects are inhaled and subsequently expelled spontaneously might or might not reach the compiler of statistics, with consequent raising or lowering of the death rate. If we infer from reported cases that the mortality is about 30 per cent., we exclude many cases in which a small body is inhaled, and subsequently expelled by coughing. Including all cases of foreign bodies inhaled into air passages collected by Durham, Gross, Weist and Roe, in which no operation was done, a total of 1,417, there was a mortality of 27 per cent.

Wood studied the pathology of foreign bodies in the lungs, both from clinical records and by experiments on animals. He collected from German and English literature, dating from 1878 to 1897, 89 cases of foreign bodies entering the lung through the upper air passages, and finds a mortality of 34 per cent., a figure which agrees closely with those already quoted. From the analysis of these cases he concludes that where an extraneous object has entered a bronchiole through the trachea it will in about 57 per cent. of the cases be spontaneously expelled, and if this takes place the almost absolute tendency is towards recovery. The

diseases resulting from the entrance of foreign bodies into the lung through the air passages are abscess, pneumonia, bronchitis, and gangrene. If the foreign body is not contaminated with especially virulent organisms, or is so formed as not to cause solution in the continuity of the mucous membrane, or does not block off the air from the lobe supplied by the bronchus in which it lies, it may be possible for it to remain in situ in the bronchus for a considerable length of time without producing any pathologic changes. The extent and malignancy of the lesions are dependent chiefly on the character and virulency of the bacteria with which the foreign body is contaminated. The shape and size play an important role, but still a secondary one, to that of the micro-organisms. A substance which is capable of disintegration causes much more extensive lesions than a smooth, stable substance.

The proper methods of treatment of inspired foreign bodies have, I believe, so changed in the last few years by the introduction of direct tracheoscopy and bronchoscopy that it is unnecessary to discuss the old operations or attempts to reach and remove the offending body. Since the endoscope of Bozzini in 1807, the introduction of endoscopy applied to different cavities of the body has been slow, and for years treated as an interesting rather than a practical proceeding. Its perfection could only be attained after the introduction of suitable illuminating devices, practical instruments, and to a less extent anesthetics. But even after the possibility of proper apparatus it was some years before it was commonly appreciated that certain apparently crooked passages are not necessarily bars to the passage of straight instruments. The trick of sword swallowing is an old one, and is probably the source of inspiration for the esophagoscope. Bevan and Kussmaul, in 1868; Mikulicz, Stoerk, and Morell MacKenzie, in 1881, and later many other observers saw the interior of the esophagus, and occasionally, sometimes by mistake, entered the trachea instead.

A history of bronchoscopy would necessarily include the history of esophagoscopy, which has long been established as a practical medical procedure. Tracheoscopy and bronchoscopy may now also be said to have passed their introductory stage and to have become one of the accepted and established proceedings of medical or, rather, surgical practice. The credit of this is largely due

to Killian. He adapted the esophagoscope to the trachea and bronchi. He made use of the work already done by Von Schroetter and Pieniazek, and of the autoscope and illuminating apparatus of Kirstein, he first removed foreign bodies from the bronchi through the natural passages, and he perfected and published details of instuments and technique which made easy the way for others to follow him. The treatise by Von Eicken, Killian's assistant in Freiburg, which appeared in 1903, covered the subject so competely at that time that although I shall quote from it freely I will refer the reader to it for a history of bronchoscopy and for many details.

The principles of tracheoscopy and bronchoscopy are very simple. They consist in sraightening out certain angles or corners by means of a stiff straight tube, through which the work is done under direct inspection. There are two of these angles, the straightening of either one of which will allow direct inspection of the bronchi; one through the natural passage by passing a tube through the mouth, pharynx, and larynx into the trachea; the second through an artificial opening into the trachea after a tracheotomy. Thus we have upper and lower bronchoscopy, which must in many respects be considered separately.

Turning to the practical value of tracheoscopy or bronchoscopy for the removal of foreign bodies which have been inhaled and impacted in the trachea or bronchi, we find that the old methods of groping blindly in the dark, often unsuccessful and sometimes causing serious trauma, have been replaced by comparative accuracy, certainty, and slight injury to the patient. Of the cases collected by Roe, combining his statistics with those of Durham, Gross, and Weist, a total of 1,234 cases in which previous to the introduction of bronchoscopy operations had been done, there was a mortality of 22 per cent. On the other hand in the report of 49 cases which I have been able to collect of removal of foreign bodies, 20 by upper and 29 by lower bronchoscopy, the mortality was 4, or about 8 per cent., 3 of the fatal cases being in a serious condition at the time of the operation. The foreign body was in the right bronchus in 29 cases, in the left in 11, and in the trachea in 4; the others not stated. Also the probability of finding the foreign body by bronchoscopy and the large chance of not recovering it after the old operations must be considered in advising operation.

The ideal method of extraction is with the aid of upper bronchoscopy. This requires a hollow tube, proper illumination and an extracting instrument. Kirstein's autoscope made possible the direct inspection of the deep pharynx and larynx; Killian's tube spatula made it easier to see and reach the interior of the larynx. Guided by these, Killian in 1897 passed a long tube through the glottis and trachea into the bronchus and extracted a foreign body. He has made a series of tubes of different calibers and lengths, with extracting and other accessory instruments, all of which are in common use to-day. The tubes are slightly bell-shaped at the end, and are graduated so that the operator can see at a glance the distance to which the end of the tube has penetrated. No stylet is used. If the trachea only is to be explored, it is seldom with adults necessary to use general anesthesia. The pharynx, epiglottis, and larynx are thoroughly cocainized before the introduction of the tracheoscope, and after its introduction the trachea is also cocainized through the tube. With children or nervous adults, or in case the bronchi are to be explored, it is usually necessary to give a general anesthetic. When cocaine only is used the patient is seated on a low chair, with the head thrown well back. All clothing round the neck should be removed. If under a general anesthetic, the patient is on his back with his head over the end of the table. That the passage of the tracheoscope with cocaine anesthesia does not require an exceptional patient nor prohibitive skill on the part of the operator is proved every day in different clinics, especially in Germany, where tubes are introduced as routine into the esophagus and trachea.

The tube is passed under direct inspection. This may be aided, especially when the longer tubes are used, by bringing the larynx into view with Kirstein's autoscope or Killian's tube spatula, and passing the autoscope through this. As the glottis is reached, the patient is told to take a deep breath and the tube is passed between the cords and downwards through the trachea to the bifurcation. In case it is necessary to enter one of the bronchi this also is done after cocainization under direct inspection. For the exploration of the bronchi the tube should be long enough to reach from the upper incisor teeth to the middle of the sternum; that is, in adults from 30 to 35 centimeters. Killian has recently introduced an extension to a bronchoscope in situ, consisting of a section of

tube of smaller caliber passed inside the first tube. A bronchus is capable of considerable movement or bringing into line by the bronchoscope, so that it may be searched through its primary or even its secondary divisions. In this case a perforated tube must be used to maintain respiration in the other bronchus. For the removal of foreign bodies from the bronchi, says Killian, a good view, great care, and quietness in procedure are essential.

There have been but few modifications of Killian's bronchoscopes, and it would seem difficult to improve on them. In order to maintain respiration in the other bronchus, Ingals made a spiral series of smaller perforations instead of the larger ones of Killian. Jackson has combined the small accessory tubes and small lamp and the stylet of Einhorn's esophagoscope with Killian's tubes. The lamp I shall speak of later. The stylet will appeal to many in passing the tube into the esophagus, and even for the larynx the author quotes Ingals as preferring the sense of touch on account of experience gained in intubation. The stylet must of course be immediately withdrawn as soon as it reaches the interior of the larynx.

When the air passages are invaded, either by a foreign body or by instruments, there may be a reflex respiratory inhibition, which under certain conditions may be serious. This has been studied by Crile, who advises that a general anesthetic should not be used unnecessarily. If it is used it is well to give a hypodermic injection of atropine to protect the circulation, and to cocainize locally. In one of my cases, previously reported, the patient stopped breathing when the bronchoscope entered the left bronchus, and artificial respiration was necessary.

After the tube the next essential is proper illumination. Much has been accomplished by a head mirror and reflected light. This is practical enough with a short tube of fairly large caliber. As it becomes longer or of smaller caliber reflected light becomes fainter and harder to manage. The least movement on the part of the patient or observer throws it out of adjustment. The absence of any other method of illumination might make it advisable to abandon the upper and resort to lower bronchoscopy. Its great advantage is that it is always available and in working order. The source of light used by Killian is generally the head lamp of Kirstein. As the operator carries the light about with him it is not thrown out of adjustment by movements

of the tube. In the electroscope of Casper a reflecting mirror with a small hole for the observer's eye is placed just in front of the entrance to the bronchoscope. It gives a better light than the head lamp for inspection or diagnosis, but is in the way if instruments are to be passed down the tube. It requires the same electrical current as Kirstein's head lamp. A small lamp at the distal end of the tube gives an illumination which has certain advantages over the others. This was used by Einhorn in his esophagoscope. Ingals first removed a foreign body by its use in a bronchoscope. This method of illumination gives a good light. The light is where it is wanted and nowhere else. It is not obstructed by instruments on their passage down the tube, and it dispenses with head apparatus and darkened rooms. The electrical current required is easily obtained, three or four dry cells, or even ordinary wet cells such as are used for ringing door bells, will suffice. It is of course a delicate apparatus which must be kept in order, and there is perhaps danger of breaking or losing the lamp in the bronchus, especially if it is simply suspended in the bronchoscope. If the lamp with its carrying rod is in a separate compartment, as in Einhorn's and Jackson's instruments, it is much better protected. With this arrangement secretion entering the end of the tube will cover the lamp and the light will either disappear or become dim, and reappear again as the secretion is removed. This happens frequently in the esophagus.

The third essential for extracting foreign bodies by direct inspection is an instrument which can be used through the tube. One form of instrument will not be sufficient for all objects. The most frequently useful will be forceps with blades of different shapes for seizing. These are made long and narrow and on the general principles of Schroetter's laryngeal forceps. Killian's extracting forceps are made with the blades attached to the tube, through which runs a wire on the end of which is a broken ring, which closes the blades when it is pushed down upon them. He also has hooks of different shapes for holding objects which are not readily grasped. An instrument designed especially for the removal of a collar stud was made by Morton in Killian's clinic. It is in the general shape of tube forceps, the tube carrying a right-angled roughened hook which is passed under the bottom of the stud. A sharp-pointed piece of metal is then pushed down, holding the stud firmly between its point and the hook.

A year ago I had a forceps made in which the handle is attached at right angles to the central shaft carrying the blades, giving a firm hold to the hand. The barrel or tube surrounding the central shaft is pushed down onto and closes the blades by the action of a trigger operated by the forefinger, the rest of the hand maintaining a firm hold of the handle. The operator is thus able to look along the shaft of the instrument without bending it, and to control the farther end under direct inspection. The central shaft is screwed into the handle so that it can be adjusted to open in any direction, and as the blades are closed by pushing the barrel onto them, not by pulling them into the barrel, they do not draw away from the object to be seized at the moment of grasping. A somewhat similar forceps was designed by Starck.

For lower bronchoscopy, where the distance is often short, I have found long thin alligator forceps, such as is described by Willis, a very convenient form.

Magnets have been suggested by De Roaldes, Jackson, MacIntire, Schroetter, and many others, and have been used for extraction by Garel, Guisez, and Thost. Their use is more limited than at first thought might appear. Not only is a special and more or less elaborate magnet required, but the foreign body must be of iron and free to move, in which case it would often be easily and more accurately extracted with forceps. It would be especially useful if a small iron body had become lodged in a small bronchial tube beyond the range of vision, or if a number of small pieces of iron, such as iron filings, had been inhaled, or if the body were of such a shape that it could not be seized by forceps or hooks.

Secretion may give much trouble by being blown out through the tube or by obstructing the view. Coughing may often be stopped by deeper local or general anesthesia. If secretion hides the field, it may be sponged with cotton or sucked out with Killian's pump. Great care must be taken that the cotton used in sponging is not left in the bronchus. It should be securely locked on the carriers. I have had made and used a carrier in which the blades which seize the cotton are locked by a collar which screws down upon them.

Upper bronchoscopy is of course the ideal method of extraction of foreign bodies. The passage of the bronchoscope involves

practically no danger, no aftertreatment, no scar. Nevertheless lower bronchoscopy is an operation of the greatest value and one which should be widely published and generally understood. The upper route is theoretically more liable to lead to infection of the lower air passages than tracheotomy, because the tubes must necessarily come in contact with the mouth and pharynx. Experience, however, does not seem to prove this danger. There is a certain danger in children that the trauma to the larynx may cause serious edema, a case of which is reported by Nehrkorn and one by Schroetter; but in adults this danger is slight. As a general rule, in cases of emergency tracheotomy should be done. If the object is free in the trachea it will often be expelled through the wound, whereas delay might allow it to become impacted in the larynx or lost in a bronchus. Tracheotomy would be indicated also if there were dyspnea or collapse or if the patient's strength were limited and for any reason the search or extraction were likely to be prolonged or difficult. It seems to me that the resulting scar after a tracheotomy is to be considered to a certain extent, and that it would be justifiable to persist in the attempt through the natural passages before opening the trachea—longer in the case of a young woman or girl than in the case of a man or boy. In a certain number of cases the object cannot be reached through the natural passages, or the attempt would involve more danger than the added danger of tracheotomy. And also for some time to come the treatment of inspired foreign bodies must often be undertaken without an equipment of elaborate instruments and by men who have had no experience in the matter. While it must be for some time only the man especially equipped who will be able to remove a foreign body from a bronchus through the natural passages, a little knowledge will enable many provided only with a short hollow tube, a long pair of forceps, and a head mirror to save the lives of their patients, with no more danger than is involved in the tracheotomy. The one important fact upon which lower bronchoscopy is based and which should be demonstrated to every surgeon is that after a tracheotomy a straight tube may easily be inserted into the wound, turned at right angles and pushed down the lower section of the trachea. If necessary, by using a perforated tube it may be continued for some distance down either bronchus. Through the tube the foreign body can generally be seen and seized. In read-

ing reports of foreign bodies published before this most simple method was suggested, we find the operator fishing in the bronchi with forceps and hooks and even cork screws, often unsuccessfully, whereas in many of the cases the object would have been easily found and removed by direct inspection.

In my experience cases of foreign bodies in the air passages are not very frequent, but foreign bodies in the esophagus are more so, and in many respects involve the same problems and are reached by the same instruments as in upper bronchoscopy. I have already reported before this Association five cases in which I have removed foreign bodies from the bronchi. I should like now to report three more which illustrate certain points.

T. L., a boy aged 8 years, was referred to me by Dr. Leland, April 1, 1905. Eight days previously he had inhaled a prune stone, folowed by cynosis and struggling, lasting many minutes. He later had similar but less violent attacks. He had periodically considerable pain in the chest, at first on the right side, later over the whole front. When seen he had periodic severe attacks of coughing, a little purulent expectoration, occasionally with blood, diminished breathing on the right side and coarse rales on both sides. Temperature 100° to 103°. The X-ray showed nothing. Killian's tube was passed to the bifurcation through the upper passages, under ether, but the amount of secretion prevented a satisfactory view. Two days later, the conditions being the same, I did a tracheotomy below the isthmus of the thyroid. A short tube of good caliber was passed into the right bronchus. After sponging much mucopurulent material the stone was seen with the edge presenting, impacted low in the right primary bronchus. I seized it with my forceps, but it was a considerable time, using all the force I dared, before I could dislodge it. After the operation the patient's temperature at once fell to normal and he made an uninterrupted recovery.

This case is interesting as showing that a foreign body may become so firmly held by its own swelling and that of the mucous membrane as to cause a serious obstacle to removal. It also shows, as has been often noted before, that even considerable infection in the lung accompanied by a certain amount of trauma will often disappear immediately as soon as the offending object is removed.

The second case may be considered as typical of the value of upper bronchoscopy.

J. D., a boy aged 9, entered the hospital October 2, 1905.

Three days before, while playing, he had inhaled a shingle nail. There was sveere coughing and choking at the time, which continued periodically with a feeling of discomfort in the sternal region. There was no blood nor dyspnea. The X-ray showed the nail apparently in the left bronchus just below the bifurcation. The next day the child was etherized after a subcutaneous injection of atropine. Placed on a table with the head over the end, the larynx was cocainized through the autoscope, and Killian's tube passed through the glottis and down to the bifurcation. The illumination was by the small lamp at the distal end after Einhorn's model. The nail was seen in the left bronchus, point up, and removed at the first attempt by Killian's forceps. The patient had n ofurther symptoms.

In a case of this kind the value of upper bronchoscopy is manifest. The necessity of a general anesthetic might be questioned. This as well as the choice between the lower or upper method must be left to the operator, and must depend upon the patient and the probable difficulty to be encountered in reaching and removing the foreign body.

The third case was an infant of 2 years, whom I saw May 30, 1906. Four days previously she had inhaled a hook. There was much respiratory disturbance at the time, which had nearly subsided. The X-ray showed the foreign body in the right bronchus. Under ether I passed a short tube illuminated by the small distal lamp into the larynx. but it was too large to pass the glottis. There were to be seen subglottic swelling and redness on one side, probably due to trauma from the foreign body. On account of the small size of the larynx and the danger of producing a serious degree of laryngeal swelling it seemed wiser to me to reach the foreign body by tracheotomy and lower bronchoscopy. The hook was immediately found by this means and removed. Later the patient was discharged well.

The experience of others seems to point to danger of laryngeal swelling in infants after upper bronchoscopy, increasing the danger of this method as compared with the lower route. I think that I could have recovered the hook in this case through the natural passage, but I doubt whether it would have been wise to make the attempt.

References.

Bevan. Lancet, 1868, p. 470.
Bozzini, Ph. Weimar, 1807.
Chiari. Krankheiten des Kehlkopfes und Luftroehren, 1905.

Coolidge, A. Boston Med. and Surg. Jour., May 25, 1905.
Coolidge. N. Y. Med. Jour., Sept. 30, 1899.
Coolidge. Boston Med. and Surg. Jour., Oct. 13, 1904.
Crile, G. W. Medical News, Jan. 27 and Feb. 24, 1900.
Eicken, Carl von. Die klinische Verwertung per directen Untersuchungsmethoden der Luft-wege, Bd. 15, Heft 3, Archiv. fuer Laryngol.
Eicken. Deut. med. Woch., No. 23, 1903.
Eicken. Beitraege zur klin. Chir., 1902, Bd. xxxiv.
Eicken. Berl. klin. Woch., 1902, No. 51.
Germain, H. H. Jour. Am. Med. Assn., July 8, 1905.
Gleitsmann and Mayer. Laryngoscope, April, 1905.
Guisez. Bull. et Mem. de la Soc. Med. d. Hopitaux de Paris, 23, xii, 1903.
Ingals, E. F. Jour. Am. Med. Assn., Nov. 19, 1904.
Ingals. Jour. Amer. Med. Assn., May 27, 1905.
Jackson. Laryngoscope, April, 1905.
Killian, G. Jour. Lar., Rhin. and Otol., Sept. and Oct., 1902.
Killian. Arch. fuer Lar., xiii, 1.
Killian. Muench. med. Woch., 1899, No. 32.
Killian. Muench. med. Woch., 1898, No. 27.
Kirstein. Arch. fuer Lar., Bd. iii, Heft 1, 2.
Kirstein. Berl. klin. Woch., 1895, No. 22.
Kallofrath. Muench. med. Woch., 1897, No. 38.
MacIntire, J. Jour. Lar., Rhin., and Otol., Sept. 1902.
Mackenzie, Morell. Med. Times and Gazette, 1881, vol. 2, p. 80.
Meyer. Berl. klin. Woch., Sept. 11, 1905.
Von Mikulicz. Centralblatt f. Chir., 1881, No. 43.
Morton, W. C. Jour. Lar., Rhin., and Otol., Jan., 1906.
Nehrkorn. Deutsch. med. Woch., Sept. 29, 1904.
Pieniazek. Muench. med. Woch., 1898, p. 723.
Roe, J. O. Burnett's System of Diseases of the Ear, Nose, and Throat, Philadelphia, 1893.
De Roaldes, A. W. Trans. Louisiana State Med. Soc., 1900.
Von Schroetter. Zur Casuistik des Fremdkoerper in den Luftwegen, 1901.
Von Schroetter. Muench. med. Woch., 1905, No. 26 and 27.
Starck, H. Die directe Besichtigung der Speiseroehre. Oesophagoskopie. Wurzburg, A. Stuben's Verlag, 1905.
Stoerk. Wien. med. Woch., 1881, Nos. 8, 25, 30.
Stillman, F. L. Ohio State Med. Jour., Mar., 1906.
Thost, A. Monatsch. fuer Ohrenheilk., 1905, No. 4.
Willis, M. W. Lancet, Dec. 10, 1904.
Wood, G. B. Philadelphia Monthly Med. Jour., June, 1899.
Yankauer. Laryngoscope, April, 1905.

GENERAL DISCUSSION ON DISEASES OF THE TRACHEA.

DR. EMIL MAYER.—Mr. Chairman, I think that I will be able very shortly to add another case to the benign tumor of the trachea, of which Dr. Theisen spoke, in a very interesting case which I saw a short time ago of a child of 7 years of age who was sent to me. Examination revealed a tumor in the trachea which was evidently the cause of the child's dyspnea. An operation is to be performed shortly, and consequently adding a new case to the benign tumors of the trachea. (The tumor was 1½ inches long, with a broad base, was removed after tracheotomy with some difficulty, was a fibroma, and the child completely recovered.)

I am especially interested in the question of bronchoscopy, which is probably the newest subject. I shall shortly record observations I made of five cases of foreign bodies in the bronchi. My only experience in regard to the subject may perhaps be of some interest in that a year ago, when Dr. Ingals and Dr. Coolidge presented the subject of foreign bodies in the bronchi, no one of us in our part of the country had taken any interest in the subject, and I became conscious of the fact that very soon we would get foreign bodies our way also. If they occurred in Boston and Chicago, they might possibly occur in New York. The only instruments we had in New York were in the possession of the chairman, Dr. Gleitsmann, who was kind enough to show them to myself and my assistant, and a set of instruments were made, and for a month we examined the bronchi on the cadaver through the courtesy of the pathologist in Mt. Sinai Hospital in the autopsy room of that institution. We thus obtained some knowledge of the introduction of the tubes. It was rather remarkable that within a month after doing this instruction work that the first case of a foreign body presented itself, and that was in the case of a child of 10 months of age that had inhaled an orange seed. It is perhaps the youngest child, as far as I know of, on record where the foreign body had been inhaled and removed by this method. My experience in subsequent cases has been that it is far easier to do the lower bronchoscopy than the upper. I myself have not reached that happy stage of being able to introduce the bronchoscopic tube at the first attempt. It requires many attempts, and the question in my mind is whether the injury done by these attempts may not be so great as to make it absolutely necessary for those who are not expert in the handling of these instruments to do the tracheotomy first,

rather than the direct method. In the last case the child had inhaled a foreign body and I did a tracheotomy and removed the foreign body inside of ten minutes from the beginning of the tracheotomy, and on the fifth day the tracheotomy tube was removed, on the seventh day the child was discharged from the hospital, and two weeks later the wound had entirely closed up. I desire to express my thanks for the way in which this subject has been presented to the Association.

DR. E. FLETCHER INGALS.—I want to speak of one instrument that is not here, a small hook that is found in Killian's set, and I wish to caution you against it. This hook is about ⅛ inch across. If you pass it beyond the bronchoscope, as you will if you use it at all, you are going to get into trouble. It would be the easiest thing in the world to pass this eighth of an inch hook into a bronchus 1-12 inch in diameter. As it is withdrawn the end of the hook is likely to catch in a branching bronchus and if it does there is no way of getting it out without tearing. I want to speak also of these sharp-toothed forceps. They must be employed with very great caution, as they are liable to catch the swollen mucous membrane. I think a serious objection to the small tube along the side of this bronchoscope for the introduction of the lamp is that the mucus or bloood collecting in it will blur the light and it cannot be cleaned without removing the bronchoscope. I think it much better to carry the lamp down inside the bronchoscope. The small lamp should be screwed securely to the carrier as in the instrument here shown, otherwise it is liable to come off in the bronchus.

The question of lower or upper bronchoscopy I think is of great importance. I have done upper bronchoscopy twelve or fourteen times and lower bronchoscopy once. I hate to open the trachea if I can get the foreign body out through the mouth, but the last case I had about three weeks ago demonstrated to my satisfaction that Dr. Coolidge's suggestion is right; and I now think it would often be better to do tracheotomy, because lower bronchoscopy is much easier. Working at the end of a long, small tube, as one has to in upper bronchoscopy in a young child, it is sometimes very difficult to know exactly what one sees. The small lamp casts a reflection about the end of the tube which is distracting, and if the Kirstein light is used on the forehead the illumination may not be sufficient; therefore the shorter and larger the tube that can be properly used the less trouble one will have. Still there are many cases in which one certainly would not be justified in opening the trachea if he could get the foreign body without it, and I think it would in most cases be better to try the upper bronchoscopy first. With the guide, spiral tube, and hollow obturator that I had made for introducing the bronchoscope, I can usually pass the tube through the glottis in half a

minute, and therefore I do not hesitate to withdraw it and reintroduce it as often as desired. Before adopting this method I hesitated very much to take out a tube that had taken me perhaps half an hour to get in.

Whether it is wise to use cocaine and atropine in these operations is a question in my mind. I did lower bronchoscopy on a little child 14 months old and removed a coffee kernel. The tracheotomy was done by the surgeon in whose care the child was, and it was done perfectly. I introduced a short tube and quickly removed the coffee kernel without any difficulty and with no possible injury to the parts. The child appeared to be in as good condition as possible after the operation; but about three or four hours afterwards it "began to sink," as the nurse and interne told me, and it kept sinking for two or three hours until it died. What that child died of I do not know. The symptoms were like those of delayed poisoning from an anesthetic or like the secondary shock sometimes spoken of by surgeons. I wrote to Killian about this and another case. He thought possibly death was due to cocaine, adrenalin or atropine that had been used. Whether I used cocaine or adrenalin or both in that particular case the records do not show and I do not know, but there were two deaths under similar circumstances, and I know that both were used with one. I think atropine in a moderate dose was also used in the older patient for checking the secretion. The adrenalin was employed to prevent the slight bleeding that would otherwise occur, and the cocaine so I would not have to use so much of the general anesthetic. I suspected that the very young child died from the shock of the tracheotomy. The other fatal case referred to was a boy about 8 years of age, from whose lung I removed a peanut by upper bronchoscopy. There were no untoward circumstances attending the operation, which proved comparatively easy. I went into the ward afterward and found the boy making a good deal of noise, as patients often do in recovering from an anesthetic. He looked so well that I felt certain he was coming out all right, yet about six or eight hours afterwards the boy went through exactly the same symptoms as the younger child and died in the same way. No autopsy could be secured in either case.

DR. COHEN.—The same bronchus?

DR. INGALS.—I do not know. Why either of these children died I do not know. I presume I used cocaine in both, but the interne did not make the note. I presume I also used adrenalin in both. It is a question whether the cocaine or adrenalin so close to the vagus would make any difference.

DR.——.—Was atropine used?

DR. INGALS.—I do not think I used any atropine in the little one, but did with the larger child. I wondered whether in the

lower bronchoscopy I could have used too large a tube in the trachea, or stretched the bronchus with it. It did not seem so at the time. These cases suggest dangers that we cannot recognize. I feel that we are safer relying on a general anesthetic than in using cocaine or adrenalin or both. Although this opinion is based on only these two cases, I have made up my mind not to use either cocaine, adrenalin, or atropine in the next few cases. In case of a foreign body in the air passages in a young woman or girl, where the scar might be a serious objection, I should under ordinary circumstances try upper bronchoscopy first, but should not persist long in my efforts before opening the trachea. It is surprising that after discovering a foreign body in the bronchus we may lose sight of it a minute later and may not be able to find it again for a long time. This is partly due to the fact that the wall of the bronchus may cover the end of the tube like the wall of the bladder, and partly to the fact that the bronchus may be entirely closed above the foreign body; and in other cases it is continually contracting and expanding, with the respiratory movements, varying in different cases, probably from the anesthetic. Lower bronchoscopy is much easier and it may be safer; yet we cannot forget that a considerable number of patients die from a simple tracheotomy.

DR. CASSELBERRY.—May I ask Dr. Ingals to describe the way in which he introduces this tube in a minute instead of a half an hour?

DR. INGALS.—I have a spiral tube which is slipped over an introducer bent to the angle of an intubation instrument. I introduce this in a child in the same way that I would an intubation tube, then withdraw the introducer, leaving the spiral tube projecting through the glottis into the trachea. I then bend the head far back and pass through the spiral tube a long steel tube, the distal end of which is rounded and perforated with several small openings. Through this the patient can breathe freely. The spiral tube is then withdrawn and the straight tube left projecting through the glottis into the trachea. Over this a bronchoscope can be passed without difficulty and then the steel tube is withdrawn.

DR. CASSELBERRY.—You practically make an intubation first, and leave a guide in the larynx?

DR. INGALS.—Yes.

DR. J. SOLIS-COHEN.—There is one clinical point I would like to mention, because I saw a good deal of it when I was in active practice, before the days of intubation, and that was the stenosis after tracheotomy. I think that the stenosis in the upper part of the trachea came from performing the tracheotomy too high, while in the lower it was usually due to the irritation. My practice was to have two tubes, one a little longer than the other, and

to change them alternate days. Thus one day the pressure was on one portion of the mucous membrane, and the next day the pressure was on another portion. In that way you can avoid stenosis. You can also vary the position that the cannula occupies in the lumen of the trachea by placing a compress above the plate or below it, as required. The tubes ought to be properly taken care of by daily cleansing. Then instead of having my tubes circular, as most of them are still made, I had them flattened from side to side, and thus they did not press so much upon the incised cartilages and there was less danger of having necrosis of the trachea. I think that if those points are observed we will avoid the stenosis after tracheotomy.

DR. D. BRYSON DELAVAN.—The remark of the last speaker on the action upon the vagus is to my mind a very important matter. Such observations have been suggested in the case of extensive operations upon the larynx through a variety of unfortunate results which have taken place, notably in laryngectomy, and these observations have called our attention to the possible harm to the pneumogastric through manipulation of the adjacent parts. Possibly some of the otherwise inexplicable accidents which have happened may and likely have been due to influences of this kind, and a careful study of the matter is desirable in view of the progress already made, especially through the admirable work of Crile. The great value of bronchoscopy is beyond question.

DR. THOMAS HUBBARD.—The observation by Dr. Simpson that there are two types of respiratory stridor characteristic of laryngeal and tracheal stenoses was exemplified in a case which I had under observation for some time and which finally came to operation—laryngo-fissure. I found a firm cicatricial union of the vocal cords, leaving a very small lumen and some fibrous tissue subglottic. This was freely incised and excised, giving a nearly normal glottis. After recovery from anesthesia it was found that, although there was a fair voice, the respiration was not improved, and laryngoscopic examination showed a second stenosis low in the trachea. I am confident that one could discriminate between stridor of laryngeal and tracheal origin from study of this case. The former has more of the voice quality and the latter of the character heard in asthmatic dyspnea. This patient refused a second operation, to my regret, for it seemed an ideal condition for excision of the thin cicatrical circular band in the trachea.

DR. T. J. HARRIS.—Dr. Cohen's idea suggests a case that I saw recently with a colleague, which was very puzzling to me. I wish that Dr. Simpson in referring to the stenoses might offer some explanation. The case was that of a man of about 60, on whom my colleague had operated for carcinoma of the larynx, having done a trcheotomy which had been for the time being entirely successful. I think it had been done about four weeks before I

saw the case and at this time the doctor was endeavoring to overcome an increased dyspnea. The patient was anesthetized in order to permit him to examine the trachea, and we found a considerable amount of granulation tissue around the wound. This was removed, but the ability to breathe was not increased. Every tracheotomy tube was tried to improve the breathing, but no tube could be introduced which did this. The doctor put in a short tube and allowed the patient to go back to the ward. Later he told me that the patient died during the night. It was impossible for us to locate the stenosis, and yet there seemed to be some form of stricture below the possibility of our determining. The tracheotomy was at a point fairly low down, though not very low.

DR. H. L. SWAIN.—I would like to ask Dr. Simpson if he has had much trouble from granulation tissue in cases of prolonged sojourn of intubation tubes, particularly at points below the lower end of the tube.

Speaking of stenoses, I had two or three cases that puzzled me very much in locating where the tracheal stenosis was until I happened to feel of the thyroid gland, and then discovered what was compressing the trachea into such a shape that it was a little more than one-quarter or one-third of its original anterior-posterior diameter.

DR. J. O. ROE.—I simply wish to say a few words on the subject of tracheotomy. I regard bronchoscopy, enabling us to inspect the interior of the trachea without performing tracheotomy, the greatest advance that has been made in this department in recent years. Dr. Theisen in his paper, I think, mentioned several cases of children or persons dying from sudden suffocation who some time before had had tracheotomy performed on them. It is a well-known fact that after tracheotomy there is great danger of the formation of papillomata along the wound in the interior of the trachea, and this, in these cases, is the cause of the sudden deaths from laryngeal spasm. One of the great advantages of intubation in diphtheria is the avoidance of tracheotomy. At a medical dinner party, of about twenty-five covers, a short time ago, the subject of tracheotomy happened to come up in relation to an important case in which many were interested. I asked those present how many persons or patients they knew of, over 21 years of age, who had had tracheotomy performed on them in infancy or early childhood. There were but two at the whole dinner table that knew of one or two patients that had survived an operation of tracheotomy until adult life. I would like to call the attention of my colleagues to this subject, and ask them the same question.

DR. COHEN.—I know of a dozen. I think I should say at least a dozen in Philadelphia, all my own patients. There is hardly a year passes that one does not come in my office.

DR. ROE.—Very few surgeons have had the extensive experience of Dr. Cohen in performing the operation of tracheotomy and can give such a report. I do not say that all children on whom tracheotomy has been performed in infancy die subsequently from laryngeal spasm, but if careful records were kept they would show a great many. It would also be interesting to know in this connection how many physicians have had patients on whom tracheotomy was performed in infancy that died afterwards of sudden suffocation without assignable cause. You will find a great many of them. Tracheotomy, therefore, should be avoided, where possible, in every instance; and one of the greatest advances made in this department is the rendering of this operation more and more unnecessary.

DR. J. W. GLEITSMANN.—I want to mention that these tubes in halves which Dr. Coolidge showed have been known to turn sometimes over each other, to cross each other, which is an unpleasant occurrence, but they are very suitable for the introduction of the long bronchoscope. To the gentlemen who are particularly interested in bronchoscopy, which now seems to be the feature of the day, I probably say nothing new, but perhaps for some it is new, and there is an excellent article on additional and improved instruments for extraction of foreign bodies in a recent number of the *Journal of Laryngology*. Dr. Morton, who worked with Dr. Killian, saw the difficulty of removing flat pieces or little buttons, and devised ingenious instruments capable of taking hold of any foreign body.

DR. COHEN.—I think you will find it in the *American Journal*, in my article.

DR. SIMPSON.—I think we ought not to forget the short O'Dwyer tubes in attempting to extract foreign bodies from the trachea. If the foreign body is smaller than the tube, and is not too tight in the trachea, and if we can get those short cylindrical tubes below the vocal cords, we can, in a number of cases, have the foreign body expelled through the tubes simply by coughing. The tubes are called "foreign body tubes."

DR. C. F. THEISEN.—I will not say anything more on my own subject, because some of the Fellows assured me they had not entirely recovered from my paper. I would like to mention that in looking up the literature in preparing my paper I found that Schroetter had described a bronchoscope devised after a new principle. His bronchoscope has the same general shape, but is made of glass surrounded by a metal tube. He has a circular light around the proximal end, so that when the bronchoscope is passed the light is transmitted along the inner tube, which is painted black, the light appearing at the distal end. His instrument does away entirely with the passing of the little lamps through the bronchoscope. He mentions the accident that Dr.

Ingals speaks of, of the little lamp breaking off and falling into the bronchus.

DR. COHEN.—Does it give a good illumination?

DR. THEISEN.—Yes. The author claims that it does. Dr. Roe asked me a question. I do not think that he got the reference entirely correct that I made in my paper in regard to the papillomatous excrescences or granulations that follow tracheotomy for the removal of tracheal tumors. I mentioned that a good many cases died of suffocation in which tracheotomy had not been performed. Of course other cases have been reported, in which sudden death has occurred subsequent to tracheotomy, after the tracheal cannula was removed, and I myself a few years ago performed a second tracheotomy on a patient who had had tracheotomy performed in childhood.

DR. ROE.—I referred to those cases where tracheotomy had been performed for other causes, and papilloma had resulted.

DR. THEISEN.—I did not mention that. That was more under the head of Dr. Simpson's paper.

DR. SIMPSON.—In closing the discussion I would like to pass the glass and the soft rubber cannulas to which I referred. The article by Killian describing these in the *Archives of Rhinology and Laryngology* in 1904 goes very extensively into the use of glass tubes for dilatation of tracheal stricture.

DR. COHEN.—What is the object of glass instead of metal?

DR. SIMPSON.—Because it is cleaner and exerts less deep pressure, and it does not generate those calcareous deposits which so frequently get on metal tubes. I would suggest in any long use in intubation proceedings, if possible do not use the metal tubes, because they generate a calcareous deposit which forms foci for further irritation.

In closing my discussion: the question of Dr. Harris relative to the cause of that dyspnea: It is difficult to tell exactly, but I should think one of those cases due to a very deep pressure with sudden dyspnea similar to one of the two cases I recorded in my paper. I think the dyspnea of those cases of deep tracheal pressure often comes on suddenly, when we cannot offer much relief.

Dr. Swain's question: I have seen but a few cases of granulation from prolonged intubation tube. When the intubation tube is worn a long time in children we will have some granulation of that kind. I think the advice offered by Dr. Cohen is most excellent; that is, changing the shape and size of the tracheotomy tube.

DR. COOLIDGE.—More experience will enable us to decide better whether upper or lower bronchoscopy is indicated in a particular case. Dr. Solis-Cohen suggests that there may be serious respiratory disturbance caused by passing the tube through the larynx;

on the other hand Dr. Roe speaks of late unfavorable results following tracheotomy. Among other things the operator must always consider his equipment; the general surgeon will incline towards tracheotomy and the very simple lower bronchoscopy, when for the same case the laryngologist might choose the upper route.

In regard to the small distal lamp; I always feel safer to have it in a separate compartment of the bronchoscope. If the surface of the inside of the tube is bright there is a disconcerting dazzle, which can largely be overcome by blackening the metal.

In regard to instruments for sponging and extracting, they should never have an angle or edge which could possibly catch on the lower rim of the bronchoscope on withdrawal.

The instruments spoken of by the President I have referred to in my paper. That by Dr. Theisen I have not seen. Anything which diminishes the caliber of the tube increases the difficulty both of illumination and of extraction.

DR. COHEN.—If the small lamp in the bronchoscope becomes dim, would it not be easy to take it out and clean it?

DR. COOLIDGE.—The diminution in light is not due to coating of the lamp, but to secretion which rises in the tube and covers the lamp. When the secretion is removed the light appears again.

EXHIBITION OF SKIAGRAPHS SHOWING VARIOUS DISEASED CONDITIONS AND ANOMALIES OF THE ACCESSORY SINUSES OF THE NOSE.

BY CORNELIUS G. COAKLEY, M.D.

DR. COAKLEY exhibited twenty skiagraph negatives made for him by Dr. E. W. Caldwell from patients suffering with sinus disease. He also showed some experimental plates made by Drs. Chisholm and Caldwell at the Gibbs X-ray laboratory of the University and Bellevue Hospital Medical School. These were for the purpose of determining, if possible, the cause of the light areas that had been invariably found in diseased sinuses when a good negative of such sinus was obtained. Dr. Chisholm's experiments showed, first, that tubes filled with pus, blood, water, normal saline solution and gelatin all interrupted the X-rays and cast a shadow that was not present in the air-filled tube; second, that intestinal mucous membrane when moist cast a very deep shadow as compared with the same mucous membrane when desiccated; third, that the greater the thickness of the moist mucous membrane, the greater the depth of the shadow; fourth, a skull was photographed showing beautifully the size and shape of the frontal sinuses, both of which were equal so far as any shadow was concerned. An opening was then made in one frontal sinus and that cavity filled with gelatin and the head again exposed to the X-rays. The frontal sinus so filled cast a very decided shadow, whereas the unfilled frontal sinus was as clear as in the original plate. The conclusions to be drawn from Dr. Chisholm's experiments are:

First, that an empty frontal sinus with a normal membrane shows a clear, sharp outline.

Second, that a frontal sinus filled with fluid, when the membrane is normal, invariably presents a cloudy appearance with the outline of the sinus less sharply defined.

Third, from the intestinal mucous membrane experiments it is

fair to infer that a frontal sinus lined with thickened, hypertrophied, so-called polypoid mucous membrane will present the same blurred appearance as one filled with fluid.

Fourth, the writer believes from his experience resulting from operating upon about forty patients whose heads were skiagraphed before operating that the shadows found in good skiagraphs indicate disease, but whether the shadow is due entirely to the secretion in the cavity or to thickening of the mucosa, or both, cannot be determined beforehand by a study of the plate. It may, in fact, be due to both of these causes.

The four accompanying cuts will, it is hoped, illustrate some

Fig. 1.

of the points shown by the negatives of Dr. Coakley. It is regretted that much of the detail in the negatives is lost in attempts to reproduce them either by prints or by lantern slides.

Fig. 1 shows two enormous frontal sinuses with a septum between the two practically in the median line at the lower portion but curving to the left at the upper portion. The right frontal sinus is almost completely divided by a septum which is bowed to the right, making the inner portion fully twice the size of the outer portion. The left frontal sinus is similarly subdivided, but having a much smaller cavity at the outer portion than the right.

The lateral extent of these sinuses is very great, passing beyond the middle of the orbital cavity. The outlines of the frontal sinuses, while fairly distinct, are not nearly so clear as are found in a healthy sinus. The ethmoidal regions on both sides are darker than they should be. The left antrum was filled with pus and does not show as clear as the right side.

Fig. 2.

Fig. 2. Two frontal sinuses, a very large septum between the two, inclined slightly to the left; outline of the right frontal sinus, which is healthy, fairly distinct; outline of the left frontal sinus scarcely perceptible; left ethmoidal region darkened and diseased, left antrum darkened and diseased.

Fig. 3. Two very large frontal sinuses, of which the right is

healthy and the left diseased; septum extends vertically for about half the distance, then inclines at a rather sharp angle to the left. The left frontal sinus extends very much higher than the right and very much further laterally. Thickened area on the lower portion of the left frontal sinus, which in this case was very deep, indicates the pus and thickened membrane.

Fig. 4. Patient on whom repeated skiagraphs failed to show

Fig. 3.

any sinus. Operation determined that no frontal sinus existed above the orbital arch, merely a slight recess extending slightly above the external canthus of the eye. The ethmoidal cells were badly diseased, as shown on the left side in the skiagraph.

As a result of examination of probably one hundred and fifty skiagraphs my conclusions are as follows:

That by means of skiagraphy one can always determine, first, the presence or absence of a sinus before operation. This in a number of cases is a decided advance, on account of the difficulty

of determining from the presence of pus in the middle meatus whether it comes from the ethmoidal cells or the frontal sinus.

Second. Accurate determination of the sizes of the frontal sinuses. For this purpose one should have not only an antero-posterior view, which would give the height and width of the

Fig. 4.

sinuses, but a transverse view, which would determine the depth of the sinuses.

The knowledge derived from a study of the sinuses in these two positions is most valuable in being able to predict the amount of deformity likely to result from any operative procedure. Sinuses that are not very high or broad, especially sinuses which are not very deep antero-posteriorly, are not followed by much deformity. A high, deep, broad sinus is certain to be followed by more or less deformity whenever much or all of the anterior wall of the sinus is removed.

Third. Situation of a septum between two sinuses can usually

be located. The line of junction of the interfrontal suture and the projection forward of the spine of the ethmoid are very apt to simulate a septum between the two sinuses unless great care be taken to examine the negative closely.

Fourth. Partial septa within the sinuses can be located very accurately.

Fifth. A dark shadow at the lower portion of the sinus running parallel with the orbit has invariably been found to be a prolongation running backward over the roof of the orbit. This is valuable information to have before beginning an operation and often leads one to adopt a different procedure than where such an orbital recess does not exist.

Sixth. In a good negative diseased conditions of the sinus can be positively determined. It is far easier to determine this where only one sinus is involved than where bilateral frontal sinusitis exists. In the former case one frontal sinus is cloudy, which makes the difference between that and the healthy side very striking. When disease is present in both frontal sinuses then the cloudy areas and indistinct outlines may make one hesitate between considering it disease or a poor negative. For in a poor negative the outlines are always indistinct and a general cloudiness pervades the entire plate. If, however, we find certain parts of the plate clear and distinct one may still be concerned with the fact that the negative may be foggy only in the area occupied by the frontal sinus. We feel, however, that with the experience resulting from examination of a number of plates artificial defects in the plate may be ruled out and the disease determined.

Seventh. As results of various operations on the frontal sinuses become better known we believe it will be found that no one method of operating will be best suited to every case; that sinuses will be classified according to their height, width, and depth, and that by means of the aid which skiagraphy gives us we can determine beforehand which method of operating to follow. For the ethmoidal cells skiagraphy is of considerable value in giving us, first, the width of the ethmoidal cell area; secondly, the height of the same; and, thirdly, the presence of disease.

For the maxillary sinus skiagraphy has invariably shown a cloudy area when the mucous membrane has been thickened or the cavity filled with pus. The readiness, however, with which the maxillary sinus can be punctured and irrigated makes the

skiagraph of much less use in this sinus than in the frontal or ethmoidal sinus. For the sphenoidal sinus we have as yet been unable to get any assistance from skiagraphy. In some of the patients skiagraphed the sphenoid was diseased, but in none of the skiagraphs was the disease shown. This is probably due to the central position of the sphenoidal sinus and to the layers of bone through which the X-rays have to pass after going through the sphenoidal sinus.*

Discussion.

DR. EMIL MAYER.—I would like to have Dr. Coakley explain exactly the process of taking the picture, the position of the patient, the place where the plate is placed, where the bulb is placed, so that when we follow up his method we may do so exactly. A number of gentlemen have asked a similar question, and a brief description of that would be helpful to us.

DR. H. L. SWAIN.—I just want to say one word, that Dr. Coakley has much to be thankful for in that he has Dr. Caldwell to take pictures for him. I had seen some of these beautiful pictures, and went home full of enthusiasm, but we cannot in New Haven get such nice plates as he does. I have had a good machine used by an unusually good man, but we cannot do the work that Dr. Caldwell does for Dr. Coakley. However, we are progressing, and doing better work. If in a certain patient I could have obtained a plate as good as what Dr. Coakley calls a bad one, it would have saved me a lot of trouble. The case was very acute. The X-ray machine was not working, and the transillumination deceived us completely, showing it must be, as Dr. Coakley has so well shown, the fluid in the tissue that makes the shadow and not always free fluid in the cavity. One side of this patient was absolutely black and the other absolutely light. The man was suffering severely and I made a puncture below into the inferior meatus and not a particle of fluid came out. He, however, was relieved and later cleared up completely, so that now transillumination shows both sides alike. It was merely the edematous infiltration of the lining membrane.

DR. F. W. HINKEL.—I want to echo what Dr. Swain says about getting such beautiful work done. I have some very pretty radiographs taken laterally, but I had the greatest difficulty with those taken antero-posteriorly. I had none as choice as these shown here.

DR. SOLIS-COHEN.—I think that is due to the exposure.

DR. G. H. MAKUEN.—I would like to ask Dr. Coakley how

*For further details as to technical matters Dr. Coakley said he would refer to a paper to be read by Dr. Caldwell before the American Roentgen Ray Society, at Niagara Falls, August 28, 1906.

many pictures he had to take in order to get these excellent ones he has shown us, and whether these are the pick of a large number?

DR. SWAIN.—Is the light underneath?

DR. COAKLEY.—Yes.

DR. SWAIN.—Does it rest on a glass cover?

DR. COAKLEY.—No. The light and plate carrier are in an arm. The light goes under the couch, if you call it so, and the plate above.

DR. SWAIN.—What is the couch made of?

DR. COAKLEY.—Canvas couch.

PRESENTATIONS OF PATIENTS, INSTRUMENTS AND SPECIMENS.

Dr. John O. Roe presented a skull, illustrating the points mentioned in his paper.

Dr. J. Price-Brown introduced the patient whose operation formed the basis of his paper. He also exhibited a series of rubber models illustrating his operation.

Dr. John M. Ingersoll exhibited the larynx from one of the cases described in his paper.

Dr. William Lincoln gave a lantern-slide demonstration of the various deformities caused by mouth-breathing as discussed in his paper.

Dr. Cornelius G. Coakley gave a demonstration of skiagrams illustrating sinus disease and Dr. J. Solis-Cohen presented some stereoscopic pictures of the same lesions.

Dr. Clement F. Theisen exhibited a portion of the tumor (intratracheal strumor) referred to in his paper.

In connection with the discussion on tracheal diseases, Drs. Cohen, Simpson, and Coolidge exhibited various instruments.

Dr. Otto T. Freer exhibited his pernasal forceps for adenoid operations.

AMERICAN LARYNGOLOGICAL ASSOCIATION.

Business Meeting.

The Twenty-eighth Annual Congress of the American Laryngological Association was held at the New Prospect House, Niagara Falls, N. Y., on Thursday, Friday, and Saturday, May 31, June 1 and 2, 1906, under the Presidency of Dr. J. W. Gleitsmann, of New York City. The sessions opened on Thursday, May 31st at 10 A. M. During the Congress the following Active Fellows were in attendance:

W. L. Ballenger, Chicago, Ill.
J. Price-Brown, Toronto, Canada.
J. H. Bryan, Washington, D. C.
W. E. Casselberry, Chicago, Ill.
C. G. Coakley, New York City.
F. C. Cobb, Boston, Mass.
J. Solis-Cohen, Philadelphia, Pa.
A. Coolidge, Jr., Boston, Mass.
D. B. Delavan, New York City.
O. T. Freer, Chicago, Ill.
Richard Frothingham, New York City.
J. W. Gleitsmann, New York City.
J. L. Goodale, Boston, Mass.
T. H. Halstead, Syracuse, N. Y.
T. J. Harris, New York City.
J. H. Hartman, Baltimore, Md.
F. W. Hinkel, Buffalo, N. Y.
F. E. Hopkins, Springfield, Mass.
Thomas Hubbard, Toledo, Ohio.
E. F. Ingals, Chicago, Ill.
J. M. Ingersoll, Cleveland, Ohio.
Samuel Johnston, Baltimore, Md.
William Lincoln, Cleveland, Ohio.
G. H. Makuen, Philadelphia, Pa.

EMIL MAYER, New York City.
J. E. NEWCOMB, New York City.
N. H. PIERCE, Chicago, Ill.
W. S. RENNER, Buffalo, N. Y.
J. E. RHODES, Chicago, Ill.
C. W. RICHARDSON, Washington, D. C.
J. O. ROE, Rochester, N. Y.
W. K. SIMPSON, New York City.
H. L. SWAIN, New Haven, Conn.
C. F. THEISEN, Albany, N. Y.
A. B. THRASHER, Cincinnati, Ohio.
J. R. WINSLOW, Baltimore, Md.
G. B. WOOD, Philadelphia, Pa.

Total, 37.

Following the reading of the President's Address and as far as time permitted, the reading of papers assigned for the morning, the Association held an executive session. The first order of business was the election of new members. For Active Fellowship the following candidates were presented by the Council:

Dr. William L. Ballenger, Chicago, proposed by Drs. Casselberry and Swain. Thesis, "The Clinical Anatomy of the Tonsil."

Dr. D. Crosby Greene, Jr., Boston, proposed by Drs. Langmaid and Clark. Thesis, "Investigations on the Lymphatic Drainage of the Larynx."

Dr. Norval H. Pierce, Chicago, proposed by Drs. Ingals and Freer. Thesis, "Laryngeal Phlegmon."

Dr. John R. Winslow, Baltimore, proposed by Drs. Johnston and Hartman. Thesis, "What is the Present Status of the Operative Treatment of Deviation of the Nasal Septum? A critical review based upon literature and especially a personal experience of 121 cases, operated upon by various methods."

Drs. Mayer and Hopkins acted as tellers, announcing that all votes cast were in favor of the gentlemen named, and they were declared elected.

Drs. Freer and Makuen were appointed a committee to audit the Treasurer's books and annual report.

A committee of five was chosen to nominate officers for the coming year. Dr. Swain was elected chairman and his associates

were Drs. Bryan, Cobb, Casselberry, and Cohen. At one o'clock the meeting adjourned and the Fellows were entertained at lunch by Dr. Renner at the hotel.

In the afternoon such papers as were not reached on the morning's programme were read and the Symposium on Diseases of the Trachea was opened. Adjournment at six o'clock.

In the evening the Fellows were entertained at a smoker given by Dr. J. Price-Brown at the International Hotel. On this occasion Dr. Brown extended on behalf of Dr. R. A. Reeve, President-elect of the British Medical Association for 1907, a cordial invitation to the Fellows to attend the coming meeting of the Association in Toronto.

At the executive session on Friday, June 1st, the following reports were read and ordered on file:

Secretary's Report.

Since the close of the last congress no deaths have occurred among the membership of the Association. One Active Fellow has resigned. Inclusive of the candidates elected at this congress, the number of Active Fellows is now 82.

Following precedent, the Transactions of 1905 are herewith presented. They were distributed in October last. The usual edition of 250 copies was printed and about 200 copies distributed to Fellows, and to medical libraries, societies, and institutions throughout the world. Some copies have been sold to non-members. The ouside demand for the volumes by the profession is not large but is steady, and there is an increasing demand for them on the part of medical libraries, which in this country are rapidly increasing in number. At the request of our colleague, Dr. Holger Mygind, a complete file beginning with the issue of 1888 was sent to the library of the hospital in Copenhagen, with which he is connected. An appreciative letter was received from him in reply. The matter of the custody of the volumes now on hand is one which must in the near future receive consideration. At present, through the courtesy of Dr. Swain, the majority are stored in his residence, while the remainder are in charge of the present Secretary.

Meetings of the Council during the year have been held as follows, January 6 and May 31, 1906. (Minutes read.)

Respectfully submitted,

JAMES E. NEWCOMB, *Secretary.*

Falls, June 1, 1906.

Annual Report of the Treasurer for the year ending May 31, 1906.

Receipts.

Balance from old account	$228.91
Sale of dinner tickets, 1905	205.00
Sale of Transactions	47.75
Exchange on cheque	.25
Arrears of dues	90.00
Dues for 1906	730.00
Dues for 1907	10.00
Loan Riverside Bank	400.00
Total	$1,711.91

Expenditures.

Annual dinner, 1905	$205.00
Stenographer's bill, 1905	90.60
Publishing Transactions, 1905	576.63
Treasurer American Committee, Lisbon International Congress	25.00
Printing and stationery	45.00
Repayment bank loan	400.00
Interest on loan	6.00
Programmes and distribution, Congress 1905	30.50
Expenses Secretary and Treasurer	15.46
Total	$1,394.23
Balance to new account	317.68
Total	$1,711.91

Statement of Assets and Liabilities, June 1, 1906.

Assets. Unpaid dues	$ 90.00
Postage in office	3.01
Cash in bank	317.68
Total	$410.69

Liabilities, none.

Audited and found correct.

(Signed) OTTO T. FREER,
G. HUDSON MAKUEN,
Auditing Committee.

Niagara Falls, June 1, 1906.

Librarian's Report.

Since the last meeting the Librarian has to report that 65 unbound pamphlets and 2 bound books have been added to the library of the Association.

Respectfully submitted,

J. H. BRYAN,
Librarian.

The report of the Nominating Committee was as follows:

For *President*—Dr. A. W. DeRoaldes, New Orleans, La.

For *First Vice-President*—Dr. G. Hudson Makuen, Philadelphia, Pa.

For *Second Vice-President*—Dr. A. B. Thrasher, Cincinnati, Ohio.

For *Secretary and Treasurer*—Dr. J. E. Newcomb, New York City.

For *Librarian*—Dr. J. H. Bryan, Washington, D. C.

For *Member of the Council* (to serve for four years)—Dr. J. W. Gleitsmann, New York City.

For *Member of Committee of Arrangements* for the meeting of 1907 in connection with the Triennial Congress—Dr. J. H. Bryan, Washington, D. C. Place of meeting, Washington.

The following resolutions were adopted:

Resolved, that the Treasurer be and hereby is authorized to borrow funds not to exceed five hundred dollars to defray the expense of publishing the Transactions for 1906.

Resolved, that Dr. Emil Mayer be and hereby is appointed as the representative of the Association in the matter of the proposed celebration of the seventieth birthday of our Corresponding Fellow, Prof. B. Fraenkel, of Berlin, in which celebration the Association has been in vited to participate.

A communication was laid before the Congress from Prof. O. Chiara, of Vienna, Corresponding Fellow, in which it was announced that it was proposed to hold in that city in 1908 a semicentennial celebration in honor of the establishment of teaching in laryngology by Tuerck and Czermak and inviting this Association to participate therein. The communication further stated that an expression of opinion was requested from this Association as to the advisability of holding at the same time an International Laryngological Congress. It was

Resolved, that it is the sense of the American Laryngological Association that we join with our sister societies in the establishment of the proposed International Laryngological Congress, and that the Continental authorities having the matter in charge be advised that we endorse the plan as thus far developed; furthermore, that Dr. Chiari be informed of the choice of delegates when such shall be made.

Resolved, that the Council be authorized to nominate as delegates such Active Fellows as may attend the Vienna celebration and that the Secretary be authorized to issue the customary credentials.

At the close of the executive session the reading of papers was resumed. Adjournment at 1.15 P. M. The Fellows were entertained at lunch by the President, Dr. Gleitsmann, at the hotel. At three o'clock cars were taken and the Fellows with their ladies visited the power houses of the Niagara Falls Power Co. and then took the trolley ride through the gorge as the guests of Dr. Gleitsmann.

In the evening the annual dinner was held at the New Prospect House. Thirty Fellows were in attendance.

At the closing session on Saturday morning, June 2d, the reading of papers and discussion thereon was concluded. At the following executive session the Secretary was instructed to cast a ballot in favor of the report of the Nominating Committee as read the day before. This was done and the gentlemen named in the report were declared elected to their respective offices. The following resolutions were adopted:

Resolved, that the thanks of the Association be extended to the Niagara Falls Power Co. for courtesies extended on the afternoon of June 1st.

Resolved, that the thanks of the Association be extended to the retiring President, Dr. Gleitsmann, for his courtesies extended to the Fellows during the Congress and for the able and impartial manner in which he has presided over their deliberations.

In the absence of the President-elect, Dr. Roaldes, and the First Vice-President-elect, Dr. Makuen, the Second Vice-President-elect, Dr. Thrasher, was called to the chair. There being no further business, the Congress was declared adjourned.

JAMES E. NEWCOMB,
Secretary.

MANUEL GARCIA.

The first volume of Transactions of the Association, dated 1879, enrolls as Honorary Fellow, Senor Manuel Garcia, who died at his residence in Cricklewood, London, July 1, 1906, at the age of one hundred and one years and three months. The only other Honorary Fellow of the Association was the late Sir Morell Mackenzie. The recent centennary celebration of Senor Garcia, in which this Association honorably participated, and the extensive accounts of his remarkable life, then published, render any present bibliographical data superfluous. To have carried his name on our rolls for a quarter of a century is an honor which we have keenly appreciated, and we have reason to know that Senor Garcia cordially reciprocated this feeling. He was a pioneer along a now well-trodden pathway, and a great teacher in his own profession. His face always was turned toward the light and his body enshrined a noble soul. The recollection of his remarkable career must ever remain an inspiration to those engaged in laryngological work.

LIST OF MEMBERS.

Active Fellows.

1907.

1906. BALLENGER, WILLIAM L., Columbus Memorial Building, Chicago, Ill.
1880. BEAN, C. E., Germania Life Bldg., St. Paul, Minn.
1904. BERENS, T. PASSMORE, 35 Park Ave., New York.
1893. BIRKETT, HERBERT S., 252 Mountain St., Montreal.
1893. BLISS, ARTHUR AMES, 117 South 20th St., Philadelphia, Pa.
1878. BOSWORTH, FRANCKE H., 41 Park Ave., New York.
1901. BROWN, J. PRICE-, 37 Carlton St., Toronto, Can.
1892. BROWN, MOREAU R., 34 Washington St., Chicago, Ill.
1891. BRYAN, JOSEPH H., 818 17th St., Washington, D. C.
1889. CASSELBERRY, WILLIAM E., 34 Washington St., Chicago, Ill.
1896. CHAPPELL, WALTER F., 7 East 55th St., New York.
1897. CLARK, J. PAYSON, 409 Marlborough St., Boston, Mass.
1902. COAKLEY, CORNELIUS G., 53 West 56th St., New York.
1899. COBB, FREDERIC C., 11 Marlborough St., Boston, Mass.
1905. COFFIN, LEWIS A., 156 West 58th St., New York.
1878. COHEN, J. SOLIS-, 1824 Chestnut St., Philadelphia, Pa.
1893. COOLIDGE, ALGERNON, JR., 613 Beacon St., Boston, Mass.
1882. DEBLOIS, THOMAS AMORY, 48 Gloucester St., Boston, Mass.
1881. DELAVAN, D. BRYSON, 1 East 33d St., New York.
1892. FARLOW, JOHN W., 234 Clarendon St., Boston, Mass.
1901. FREEMAN, WALTER J., 1832 Spruce St., Philadelphia, Pa.
1905. FREER, OTTO T., 34 Washington St., Chicago, Ill.
1879. FRENCH, THOMAS R., 150 Joralemon St., Brooklyn, N. Y.
1897. FROTHINGHAM, RICHARD, Sydenham Bldg., Madison Ave. and 58th St., New York.
1878. GLASGOW, WILLIAM C., 2847 Washington Ave., St. Louis, Mo.
1880. GLEITSMANN, JOSEPH W., Sydenham Building, Madison Ave. and 58th St., New York.

1898. GOODALE, JOSEPH L., 258 Beacon St., Boston, Mass.
1905. GRAYSON, CHARLES P., 251 South 16th St., Philadelphia, Pa.
1906. GREENE, D. CROSBY, JR., 483 Beacon St., Boston, Mass.
1905. HALSTED, THOMAS H., 831 University Block, Syracuse, N. Y.
1896. HARDIE, T. MELVILLE, 34 Washington St., Chicago, Ill.
1903. HARRIS, THOMAS J., 117 East 40th St., New York.
1878. HARTMAN, JACOB H., 5 West Franklin St., Baltimore, Md.
1888. HINKEL, F. WHITEHILL, 581 Delaware Ave., Buffalo, N. Y.
1881. HITCHCOCK, URBAN G., 122 West 49th St., New York.
1893. HOPE, GEORGE B., 133 West 72d St., New York.
1895. HOPKINS, FREDERIC E., 25 Harrison Ave., Springfield, Mass.
1895. HUBBARD, THOMAS, 205 Ontario St., Toledo, O.
1901. HYATT, FRANCK, 1022 14th St., N. W., Washington, D. C.
1878. INGALS, E. FLETCHER, 36 Washington St., Chicago, Ill.
1904. INGERSOLL, JOHN M., 318 Euclid Ave., Cleveland, Ohio.
1882. IVES, FRANK L., 117 East 30th St., New York.
1878. JOHNSTON, SAMUEL, 204 West Monument St., Baltimore, Md.
1901. KING, GORDON, 624 Gravier St., New Orleans, La.
1885. KNIGHT, CHARLES H., 147 West 57th St., New York.
1878. KNIGHT, FREDERICK I., 195 Beacon St., Boston, Mass.
1898. KYLE, D. BRADEN, 1517 Walnut St., Philadelphia, Pa.
1880. LANGMAID, SAMUEL W., 71 Newbury St., Boston, Mass.
1878. LEFFERTS, GEORGE MOREWOOD, 212 Madison Ave., N. Y.
1894. LELAND, GEORGE A., 669 Boylston St., Boston, Mass.
1903. LINCOLN, WILLIAM, 210 Lennox Bldg., Cleveland, O.
1897. LOGAN, JAMES E., 1208 Wyandotte St., Kansas City, Mo.
1888. LOWMAN, JOHN H., 441 Prospect St., Cleveland, O.
1886. MACCOY, ALEXANDER W., 216 South 15th St., Philadelphia, Pa.
1883. MACKENZIE, JOHN N., 605 Washington Place, Baltimore, Md.
1898. MAKUEN, G. HUDSON, 1627 Walnut St., Philadelphia, Pa.
1896. MAYER, EMIL, 25 East 77th St., New York.
1899. MCKERNON, JAMES F., 62 W. 52d St., New York.
1904. MOSHER, HARRIS P., 828 Beacon St., Boston, Mass.

1901. MYLES, ROBERT C., 46 West 38th St., New York.
1893. NEWCOMB, JAMES E., 118 West 69th St., New York.
1903. PACKARD, FRANCIS R., 1831 Chestnut St., Philadelphia, Pa.
1906. PIERCE, NORVAL H., 31 Washington St., Chicago, Ill.
1892. PORCHER, W. PEYRE, 85 Broad St., Charleston, S. C.
1878. PORTER, WILLIAM, 3886 Washington Ave., St. Louis, Mo.
1903. RENNER, W. SCOTT, 361 Pearl St., Buffalo, N. Y.
1897. RHODES, J. EDWIN, 100 State St., Chicago, Ill.
1884. RICE, CLARENCE C., 123 East 19th St., New York.
1905. RICHARDS, GEORGE L., 84 North Main St., Fall River, Mass.
1902. RICHARDSON, CHARLES W., 1317 Connecticut Ave., Washington, D. C.
1893. ROALDES, ARTHUR W. DE, 624 Gravier St., New Orleans, La.
1879. ROE, JOHN O., 44 Clinton Ave. South, Rochester, N. Y.
1878. SHURLY, ERNEST L., 32 Adams Ave. W., Detroit, Mich.
1892. SIMPSON, WILLIAM K., 952 Lexington Ave., New York.
1889. SWAIN, HENRY L., 232 York St., New Haven, Conn.
1903. THEISEN, CLEMENT F., 172 Washington Ave., Albany, N. Y.
1892. THRASHER, ALLEN B., The Groton, 7th and Race Sts., Cincinnati, Ohio.
1892. WAGNER, HENRY L., Pacific Union Club, San Francisco, Cal.
1892. WATSON, ARTHUR W., 126 South 18th St., Philadelphia, Pa.
1906. WINSLOW, JOHN R., 114 West Franklin St., Baltimore, Md.
1905. WOOD, GEORGE B., 129 South 18th St., Philadelphia, Pa.
1890. WRIGHT, JONATHAN, 44 West 49th St., New York.

CORRESPONDING FELLOWS.

1880. BRUNS, PAUL, Tübingen, Würtemberg, Germany.
1896. CHIARI, OTTOKAR, Bellariastrasse 12, Vienna, Austria.
1901. COLLIER, MAYO, 145 Harley St., Cavendish Square, London W., England.
1890. DE LA SOTA Y LASTRA, R., 7 Calle de Torqueros, Seville, Spain.
1893. DESVERNINE, C. M., Cuba 52, Havana, Cuba.
1904. FRAENKEL, B., Bellevue-Strasse 4, Berlin W. 9, Germany.
1901. GRANT, DUNDAS, 18 Cavendish Square, London W., England.
1902. HEYMANN, PAUL, 60 Lützowstrasse, Berlin W., Germany.
1894. HOLDEN, E., 13 Central Ave., Newark, N. J.
1892. KRAUSE, H., Kronprinzenufer, 15, Berlin, N. W., Germany.
1881. LABUS, CARLO, Piazza Castello 28, Milan, Italy.
1902. LERMOYEZ, MARCEL, 20 Rue de la Boetie, Paris, France.
1897. LUC, H., 54 Rue de Varenne, Paris, France.
1903. MCBRIDE, P., 16 Chester St., Edinburgh, Scotland.
1896. MACDONALD, GREVILLE, 85 Harley St., Cavendish Square, London W., England.
1894. MACINTYRE, JOHN, 179 Bath St., Glasgow, Scotland.
1892. MASSEI, F., 4 Piazza Municipio, Naples, Italy.
1887. MOURE, E. J., 25 Cours du Jardin-Public, Bordeaux, France.
1896. MYGIND, HOLGER, 31 Havnegade, Copenhagen, Denmark.
1901. NATIER, MARCEL, 12 Rue Caumartin, Paris, France.
1903. ONODI A., o'Uctza 12, Buda-Pesth, Hungary.
1894. SAJOUS, C. E., 2043 Walnut St., Philadelphia, Pa.
1901. SCHMIDT, MORITZ, Schaumainkai, Sachsenhausen, 15, Frankfort, Germany.
1896. SCHMIEGELOW, ERNEST, ix—2 Mariannengasse 3, Copenhagen, Denmark.
1881. SCHROETTER, LEOPOLD V., Schwartzenburgstrasse 8, Vienna, Austria.

1881. SEMON, SIR FELIX, 39 Wimpole St., Cavendish Square, London W., England.

1902. THOMSON, ST. CLAIR, 28 Queen Anne St., Cavendish London W., England.

1903. TILLEY, HERBERT, 89 Harley St., Cavendish Square, London W., England.

1901. WINGRAVE, WYATT, 11 Devonshire St., Portland Place, London W., England.

1894. WOLFENDEN, R. NORRIS, Rougemont, Seaford, Sussex, England.

PAST OFFICERS.

Presidents.

(Year of Election.)

1879.	Louis Elsberg.	1892.	M. J. Asch.
1880.	J. Solis-Cohen.	1893.	D. B. Delavan.
1881.	F. I. Knight.	1894.	J. O. Roe.
1882.	G. M. Lefferts.	1895.	W. H. Daly.
1883.	F. H. Bosworth.	1896.	C. H. Knight.
1884.	E. L. Shurly.	1897.	T. R. French.
1885.	Harrison Allen.	1898.	W. E. Casselberry.
1886.	E. Fletcher Ingals.	1899.	Samuel Johnston.
1887.	R. P. Lincoln.	1900.	H. L. Swain.
1888.	E. C. Morgan.	1901.	J. W. Farlow.
1889.	J. N. Mackenzie.	1902.	J. H. Bryan.
1890.	W. C. Glasgow.	1903.	J. H. Hartman.
1891.	S. W. Langmaid.	1904.	C. C. Rice.
		1905.	J. W. Gleitsmann.

Vice-Presidents.

1879. F. H. Davis.
1880. W. C. Glasgow, J. O. Roe.
1881. E. L. Shurly, W. Porter.
1882. C. Seiler, E. F. Ingals.
1883. S. W. Langmaid, S. Johnston.
1884. J. H. Hartman, W. H. Daly.
1885. H. A. Johnson, G. W. Major.
1886. E. C. Morgan, J. N. Mackenzie.
1887. J. N. Mackenzie, S. W. Langmaid.
1888. W. C. Glasgow, C. E. Sajous.
1889. E. Holden, C. E. Bean.
1890. J. O. Roe, J. H. Hartman.
1891. M. J. Asch, S. Johnston.
1892. S. Johnston, J. C. Mulhall.

1893. J. C. Mulhall, W. E. Casselberry.
1894. C. C. Rice, S. H. Chapman.
1895. J. Wright, A. W. de Roaldes.
1896. T. M. Murray, D. N. Rankin.
1897. A. W. MacCoy, H. S. Birkett.
1898. J. W. Farlow, F. W. Hinkel.
1899. T. A. DeBlois, M. R. Brown.
1900. H. L. Wagner, A. A. Bliss.
1901. J. W. Gleitsmann, D. Braden Kyle.
1902. G. A. Leland, T. Melville Hardie.
1903. J. H. Lowman, W. Peyre Porcher.
1904. Thomas Hubbard, W. J. Freeman.
1905. J. L. Goodale, C. W. Richardson.

Secretaries and Treasurers.

1879. G. M. Lefferts.
1882. D. B. Delavan.
1889. C. H. Knight.
1895. H. L. Swain.
1900. J. E. Newcomb.

Librarians.

1879. F. H. Bosworth.
1883. T. R. French.
1903. J. H. Bryan.

PAST MEMBERS.

Honorary Fellows.

*1880. Senor Manuel Garcia, London, England.
*1883. Sir Morell Mackenzie, London, England.

Corresponding Fellows.

*1892. Lennox Browne, London, England.
*1887. A. Gouguenheim, Paris, France.
*1880. Wilhelm Meyer, Copenhagen, Denmark.
*1881. Pugin Thorton, London, England.
*1881. R. Voltolini, Breslau, Germany.
*1880. W. McNeil Whistler, London, England.

Active Fellows.

*1880. Harrison Allen, Philadelphia, Pa.
*1878. Morris J. Asch, New York.
1895. J. E. Boylan, Cincinnati, Ohio.
*1883. C. W. Chamberlain, Hartford, Conn.
*1882. S. Hartwell Chapman, New Haven, Conn.
1884. S. Solis-Cohen, Philadelphia, Pa.
1880. E. W. Cushing, Boston, Mass.
1878. Ephraim Cutter, Boston, Mass.
*1880. W. H. Daly, Pittsburgh, Pa.
*1878. F. H. Davis, Chicago, Ill.
*1901. E. T. Dickerman, Chicago, Ill.
*1878. Frank Donaldson, Baltimore, Md.
1886. Frank Donaldson, Jr., Baltimore, Md.
*1879. J. H. Douglas, New York City.
*1879. W. F. Duncan, New York City.
*1878. Louis Elsberg, New York City.
†1879. Edgar Holden, Newark, N. J.
*1882. Franklin H. Hooper, Boston, Mass.

*Deceased. †Corresponding Fellow.

*1878. Hosmer A. Johnson, Chicago, Ill.
*1879. Woolsey Johnson, New York City.
*1880. William C. Jarvis, New York City.
1879. R. H. Kealhofer, St. Louis, Mo.
*1878. Rufus P. Lincoln, New York City.
1881. G. W. Major, Montreal, Canada.
1879. Charles McBurney, New York City.
1885. H. Clinton McSherry, Baltimore, Md.
*1881. E. C. Morgan, Washington, D. C.
*1886. J. C. Mulhall, St. Louis, Mo.
1892. Murray T. Morris, Washington, D. C.
1881. H. Mynter, Buffalo, N. Y.
*1895. J. E. H. Nichols, New York City.
1879. H. K. C. Oliver, Boston, Mass.
1894. William H. Park, New York City.
*1880. D. N. Rankin, Allegheny, Pa.
1881. J. M. Robertson, Detroit, Mich.
1878. Beverly Robinson, New York City.
*1878. T. F. Rumbold, St. Louis, Mo.
†1880. Charles E. Sajous, Paris, France.
1879. Carl Seiler, Scranton, Pa.
*1893. Charles M. Shields, Richmond, Va.
1879. Andrew H. Smith, New York City.
1879. Bernhard Tauber, Cincinnati, Ohio.
*1899. Max Thorner,, Cincinnati, Ohio.
1888. S. O. Van der Poel, New York City.
1878. Clinton Wagner, New York City.
1896. Marshall R. Ward, Pittsburgh, Pa.
1879. Whitfield Ward, New York City.
*1886. Benjamin F. Westbrook, Brooklyn, N. Y.
1896. Greene V. Woollen, Indianapolis, Ind.

*Deceased. †Corresponding Fellow.